COAL AGE

Volume 15 New York, June 26, 1919 Number 26

New Tools Require New Training

By R. Dawson Hall

UNFORTUNATELY, the early history of coal-mining is exercising undue influence on the elementary technical education of present-day mining men. Early mining operations were quite crude, and there was little of a scientific nature to learn about the subject except what was taught under the heads, Chemistry of Gases and Principles of Ventilation. With little or no machinery, no fans, no mining machines or locomotives, and simple pumps, there was need for little information other than about the mine atmosphere and the safety lamp.

With such a simplicity of operation, technical studies commenced, and as a knowledge of the theory of mining as then practiced was quite necessary, men were rightly required to show their efficiency in such studies before becoming mine foremen. The state examinations are still based on the conditions of that early time. We do not today educate men for their duties as foremen in a modern mine, so much as we school them so that they can pass the prescribed examinations; for these no longer determine whether a man is acquainted with the full range of the many duties that are likely to fall to him. When once the state examinations are passed we show little or no interest in his further development.

We have evolved a sort of classical education in mining. In earlier times men acquired Greek and Latin and did not hold it important to consider whether these studies really had any bearing on the problems actually to be solved in the workaday world. They continued to master them because such learning had attained predominance at a time when there was little else to study, and when the purposes of education were wholly different from those of more modern times.

The mining world branching right and left in its mechanical development, which is slowly but surely turning the mines into machine shops, now needs men of greater technical powers to handle its mine problems. It needs also many more than one man of technical knowledge in each mine to handle the multitude of new tools. It does not have any more a body of men who from childhood have been made acquainted with the implements by which the work is to be performed.

Many years back when the hand pick was not the symbol merely, but the mainstay of the industry, we had men who had learned from their fathers the fine art of handling that implement and who had been coached into the dangers of mining, the means of avoiding them and the tricks of operation. But the men of today have no such background of training in handling the modern tools of our constantly developing industry.

The operation of the new mechanisms may be more readily learned than the running of the more simple tools of the past, for the handling of a machine is often more simple than the deft manipulation of a less powerful and more primitive tool. But the art, hard or easy, must be learned, and there are few teachers on the mining force, whereas in our earlier operations there were as many teachers available as there were men employed, for every man knew mining, as then practiced, from "a" to "izzard."

We need, therefore, more and more mining schools in and about mine villages. In fact, at every mine the engineering staff should contain some man who by addresses or by training at the actual work, or both, should create increased efficiency in the handling of the mine mechanisms, the work to be supplemented by addresses given by experts at local centers. We shall only succeed when everybody knows how his work should be done.

The Chemistry and Constitution of Coal*

Much Has Been Done in the Determination of the Chemical Composition, Heating Value and Ash Fusibility of Various Coals. Recently the Microscope Has Been Brought Into Use and Has Proved a Great Aid in Determining Just What Coal Is Composed of and How It Is Built Up. Different Coal Beds Thus Appear to Be Composed of Totally Different Varieties of Plants

BY A. C. FIELDNER†
Pittsburgh, Pennsylvania

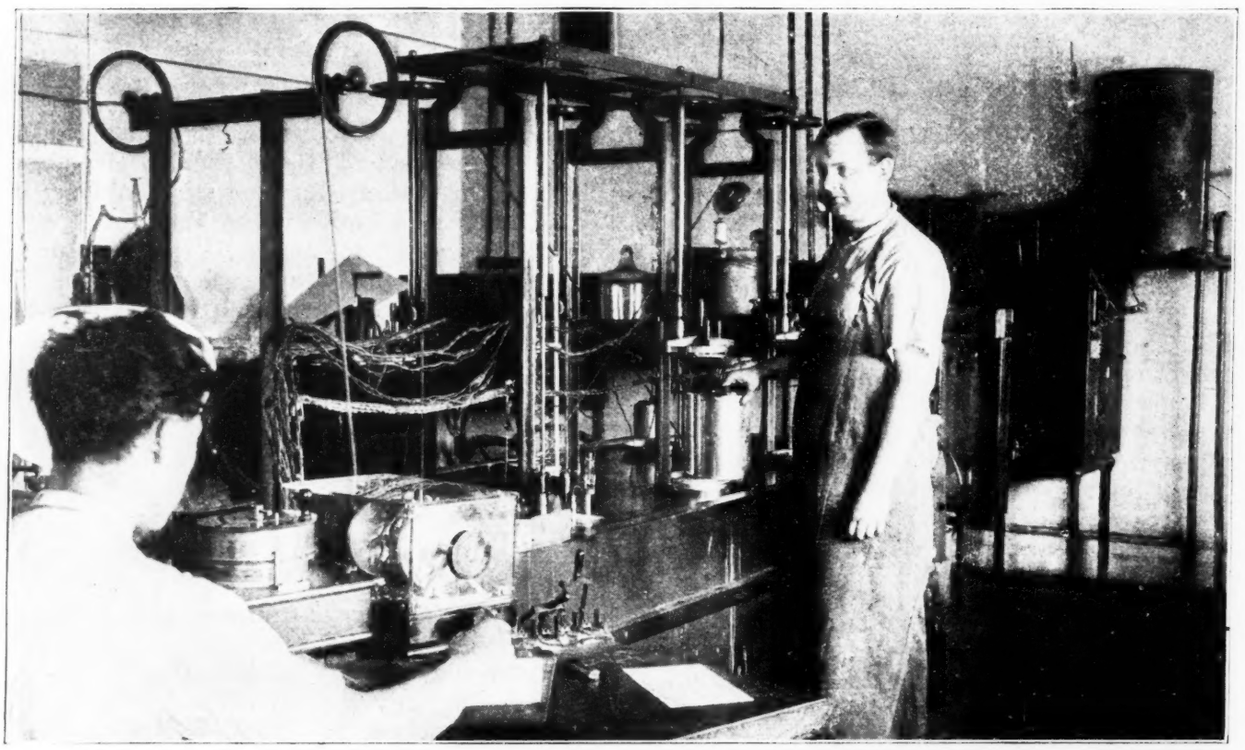


FIG. 1. BUREAU OF MINES' MULTIPLE CALORIMETER INSTALLATION

IN PRESENTING this paper on the chemistry and constitution of coal, I must explain that this all-inclusive title does not mean that it is either lengthy or exhaustive. I wish merely to give a brief review of some of the present-day aspects of the subject, with special reference to investigations that have been carried on in the Bureau of Mines Experiment Station.

Let us first consider the nature of coal. Geologists agree that coal has its origin in vegetable matter that was accumulated and buried in past geological ages. Several different theories have been advanced as to the exact manner of accumulation and the particular kinds of vegetation or vegetable products that were involved. At any rate, this accumulation became more or less altered and concentrated under swampy conditions and finally was buried under a load of sediment, to be subjected to a further change by heat and pressure.

In more or less intimate mixture with these organic remains was deposited silt, sand, clay and other earthy materials. Sometimes layers of sediment were laid down between the periods of plant growth, thus forming partings and veins of shale and slate. It is obvious, then, that the chemical constitution of coal must be extremely complex and must vary greatly from one bed to another. To determine all the real constituents in coal is beyond the power of a mere chemist. This will be appreciated later when the myriads of different substances that the microscope reveals are shown.

With our present-day knowledge we can only resolve this complex mass into its chemical elements, as is done in the ultimate analysis; or we may group the principal constituents into certain classes, as is done in the proximate analysis with which all are familiar.

The proximate analysis divides the coal into four classes of constituents: (1) Water or moisture; (2) mineral impurities that remain in a somewhat altered condition, as ash when the coal is burned; (3) volatile matter consisting of the gases and tars that are driven off on coking the coal; and (4) fixed carbon, which represents the carbonaceous residue or ash-free coke left behind after the gases are driven off.

The moisture and ash represent the incombustible or worthless part of the fuel, while the volatile matter and fixed carbon include the total combustible, which is de-

*Published by permission of the U. S. Bureau of Mines. Paper read at the Lexington meeting of the Kentucky Mining Institute, June 6, 1919.

†Supervising chemist, Pittsburgh Experimental Station, U. S. Bureau of Mines.

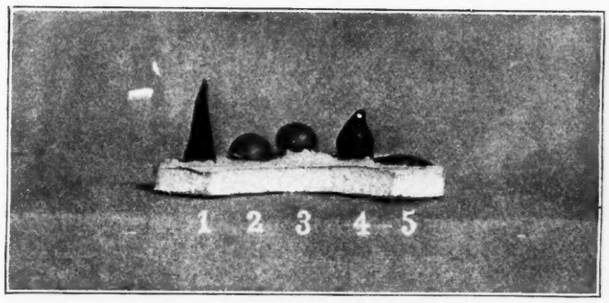


FIG. 2. TYPICAL FORMS OF ASH CONES AFTER HEATING IN NO. 3 MELTERS FURNACE

rived for the most part from the plant remains making up the coal substance.

In addition to the proximate analysis chemists have another method of attacking coal, and that is to resolve it into its chemical elements. All vegetable matter, and consequently coal, is composed principally of carbon, hydrogen and oxygen, with smaller quantities of sulphur and nitrogen. By suitable methods in the laboratory it is possible to determine with considerable accuracy the percentages of these elements.

Heating Values May Be Determined

From the ultimate analysis it is possible to calculate roughly the heating value of a coal. However, this method is no longer used, as an actual test in a calorimeter is more accurate and much simpler. The Bureau of Mines has a special multiple calorimeter installation in which six samples can be tested at one time, with an accuracy of 0.1 per cent (See Fig. 1). The results of such calorimeter tests are expressed in British thermal units. A British thermal unit is the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

In recent years, fuel engineers have demanded a test of the fusing temperature of the ash in order to get some idea of its clinkering tendencies. This test is made by molding some of the finely ground ash with the aid of an organic binder into small triangular pyramids about ¾-in. high and then heating them slowly in a furnace until the ash melts. The temperatures are read during this process and the fusion temperature is taken when the pyramid has melted down into a hemispherical lump, as shown in Fig. 2. The furnace used in the Bureau of Mines' laboratory is shown in Fig. 3. It is a slightly modified form of the No. 3 melters furnace of the American Gas Furnace Co. This furnace is operated with an excess of gas burning at the vent in order to maintain a reducing atmosphere in the combustion chamber. Under these conditions the iron in the ash is reduced to the ferrous state, which condition gives the lowest melting point and, therefore, the lowest temperature at which clinkering may result.

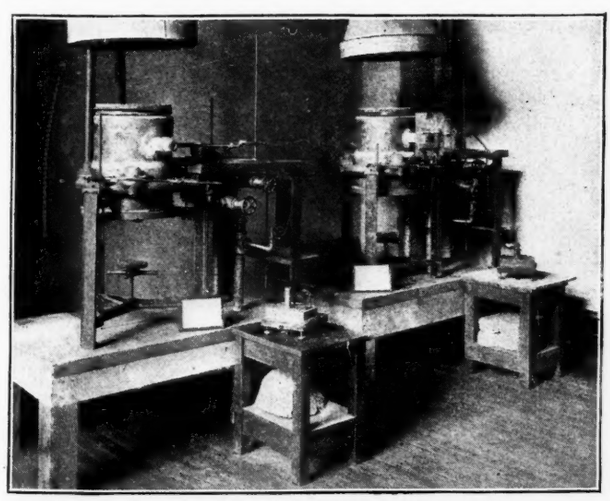


FIG. 3. FURNACES USED IN DETERMINING FUSIBILITY OF COAL ASH

During the last two years the Bureau of Mines has conducted a survey of the fusibility of ash of various American coals. It was found that the average softening temperature of the ash of the different coal beds of the country ranges from 1900 to 3100 deg. F. Certain beds in West Virginia, such as the Island Creek, Coalburg and Winifrede of the Kanawha Group, and the

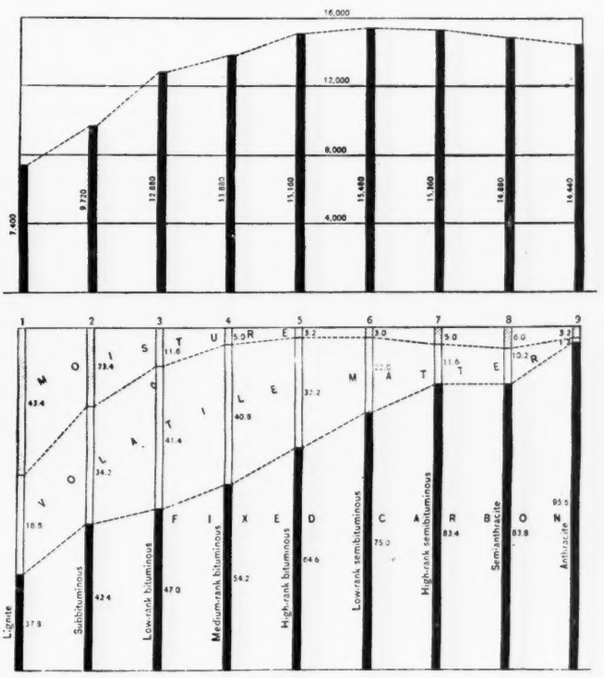


FIG. 4. CHEMICAL COMPOSITION AND HEATING VALUE OF THE SEVERAL RANKS OF COAL

Beckley bed of the New River field, have a highly refractory ash with a softening temperature of 2800 to 3200 deg. F. On the other hand, the coal beds of the Monongahela, Conemaugh and Allegheny series, both in West Virginia and Pennsylvania, are characterized by ash that has medium to low fusibility—i.e., between 2000 and 2400 deg. F. But the most fusible ashes of all come from the coal beds of Illinois, Indiana, western Kentucky and Missouri. The following are the average softening temperatures for western Kentucky beds:

Bed No.	No. of Samples Averaged	Softening Temperature, Deg. F.
6	4	2130
9	75	2030
10	2	1990
11	39	2030
12	17	2150

These low softening temperatures are due to the high percentages of pyrite and lime compounds found in coals from the interior province.

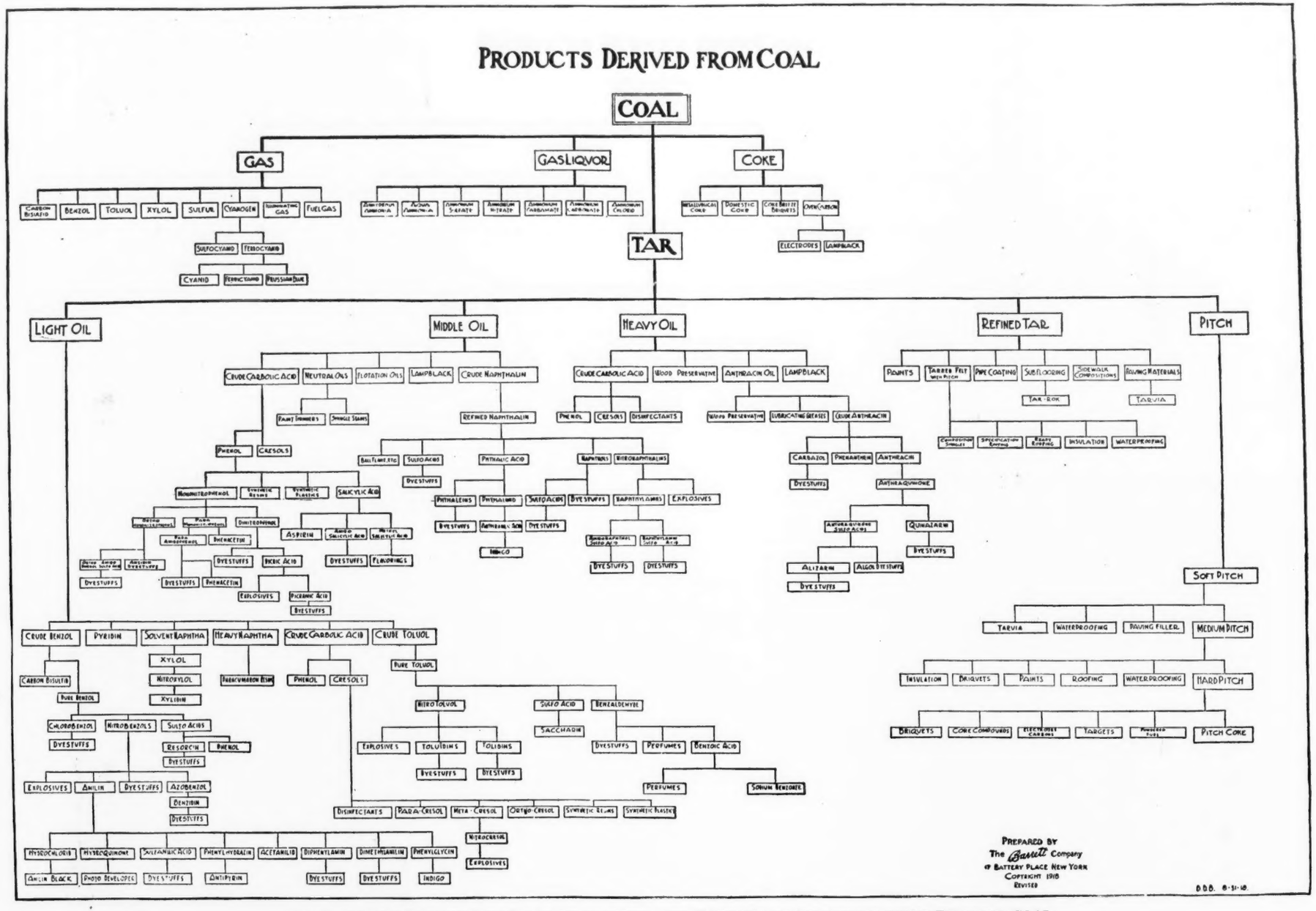
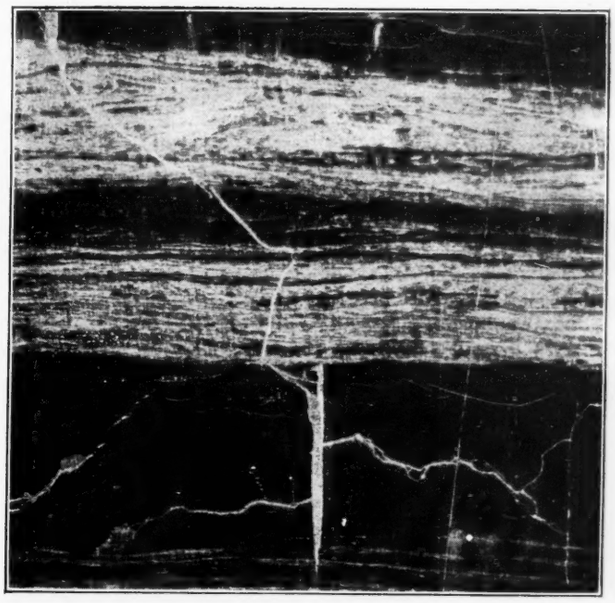


FIG. 5. CHART SHOWING THE LARGE NUMBER AND VARIETY OF PRODUCTS DERIVED FROM COAL



FIGS. 6 AND 7. A BLOCK OF ILLINOIS COAL FROM BED NO. 6, NATURAL SIZE, AND POLISHED SURFACE OF SAME BLOCK MAGNIFIED TEN DIAMETERS

The black bands represent "bright coal" or "anthraxylon"; the grayish bands represent layers of "dull coal"; the lenticular band near the bottom represents a cone of Lepidodendron

Eastern Kentucky coal has a more refractory ash as shown in the table on page 1155.

With the establishment of the United States fuel-testing plant at St. Louis, in 1904, the Federal Government began the analysis of coal from various parts of the country by uniform and standardized methods. This practice has been continued until the present time, first by the U. S. Geological Survey and since 1909 by the Bureau of Mines. Much of this work has been done in coöperation with the state geological surveys, which collected the samples and sent them to the Bureau of Mines laboratory for analysis. This plan has been mutually helpful to both the Federal and state authorities.

The results of all Bureau of Mines coal analyses are published[1] at regular intervals together with a full description of the mines and coal beds from which the samples are taken.

Classification of Coal by Ranks

On the basis of these comprehensive and uniformly made analyses, and also the physical characteristics, the U. S. Geological Survey[2] has worked out a scheme of classifying coal according to its rank, the word "rank" being used to designate those differences in coal that are due to the progressive change from lig-

[1]Bulletins 22, 85 and 123 of U. S. Bureau of Mines.

[2]Campbell, M. R.: "The Coal Fields of the United States." Professional Paper 100-A, 1919, pp. 3-10.

FIG. 8. THIN CROSS-SECTION OF "BRIGHT COAL," SHOWING WELL PRESERVED WOOD STRUCTURE

FIG. 9. THIN VERTICAL SECTION OF COAL AT HIGH MAGNIFICATION

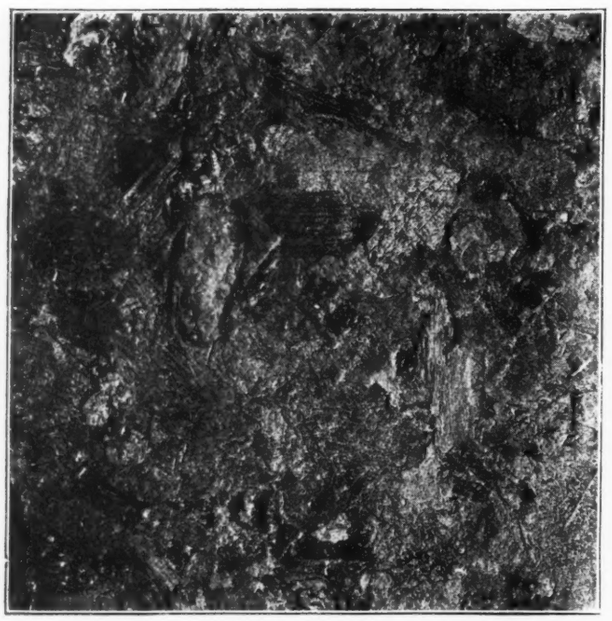


FIG. 10. A HORIZONTAL CLEAVAGE SURFACE OF COMPACT COAL

Showing patches with woody structure or anthraxylon chips, more or less surrounded by structureless areas representing attritus.

FIG. 11. A TYPICAL WISCONSIN PEAT BOG

FIG. 12. DRY PEAT FROM BOG SHOWN IN FIG. 11

Showing thin chips of wood corresponding to anthraxylon embedded in the attritus. Compare this with Fig. 10.

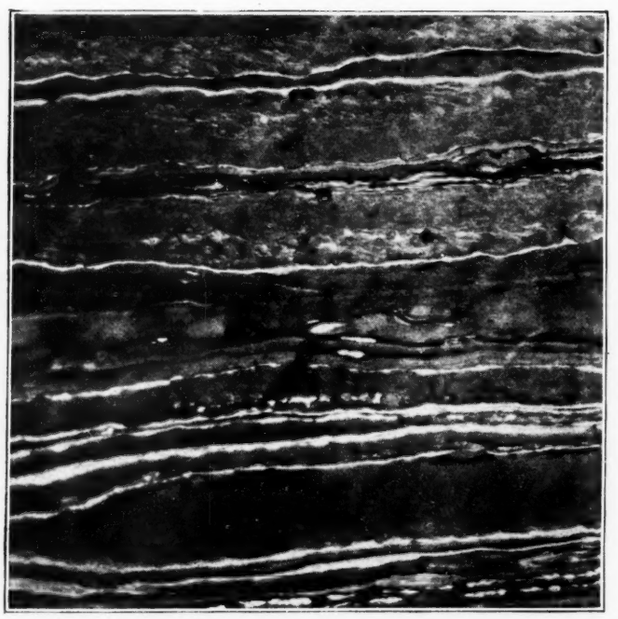


FIG. 13. VERTICAL SECTION OF "DULL COAL"

The white heavy lines running across the photograph represent leaf cuticles embedded in matter largely derived from leaves.

nite to anthracite, a change marked by the loss of moisture, of oxygen, and of volatile matter. The change is generally accompanied by an increase of fixed carbon, of sulphur and probably of ash. When, however, one coal is distinguished from another by the amount of ash or sulphur it contains, this difference is said to be one of grade. Thus "a high-grade coal" means merely one that is relatively pure, whereas "a high-rank coal" means one that is high in the scale of coals—or, in other words, one that has suffered devolatilization and that now contains a smaller percentage of volatile matter, oxygen and moisture than it contained before the change occurred. This progressive change in volatile matter and also heating value with rank of coal is shown in the diagram (Fig. 4), taken from Camp-

FIG. 14. ONE OF THE LEAF CUTICLES SEPARATED FROM THE COAL SHOWN IN FIG. 13, SEEN FLATWISE

bell's bulletin. It will be noticed that the fixed carbon gradually increases from 38 per cent. in lignite to 95.6 per cent. in anthracite. There is of course no definite boundary line between adjacent ranks; lignites shade into sub-bituminous coal and sub-bituminous into bituminous, so that one is often in doubt in which rank to place a given sample. Physical characteristics are also used to classify the rank of the coal as, for example, lignite is distinctly brown, markedly woody in appearance and slacks to a powder quickly on exposure to air, while sub-bituminous coal, the next higher rank, is black, less distinctly woody and does not slack so rapidly as lignite, although it is readily distinguished from bituminous coal because of this slacking property. Both lignite and sub-bituminous coals contain from 20 to 40 per cent. of moisture when freshly mined. This is readily given off on exposure to air and causes the slacking.

True bituminous coal contains from 3 to 16 per cent. of water, but is only slightly affected by exposure to weather. The fixed carbon varies from 40 to 70 per cent. This rank covers a wide variety of coals, as is well illustrated in the coals of Kentucky. In the western field is found typical low-rank bituminous coal with 8 to 12 per cent. moisture, 40 to 50 per cent. fixed carbon and 11,000 to 13,000 B.t.u. In eastern Kentucky there exist high-rank bituminous coals that are excellent for gas and coke production. These contain from 2 to 6 per cent. moisture, 50 to 60 per cent. fixed carbon and 13,500 to 14,500 B.t.u. There are also certain varieties of bituminous coal called cannel, splint and block coal.

Cannel coal is extremely rich in volatile matter and

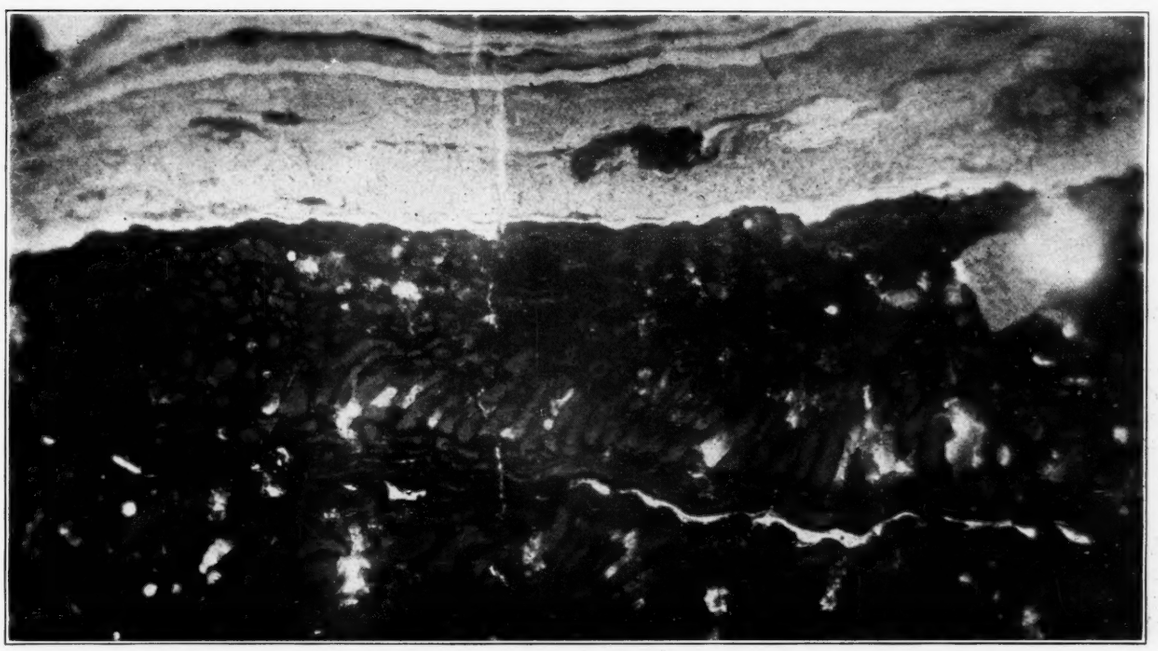


FIG. 15. THIN CROSS-SECTION OF COAL FROM SHELBYVILLE, ILL., SHOWING PARTS OF CROSS-SECTIONS ON LEAVES

ASH IN EASTERN KENTUCKY COAL

Name of Bed	No. Samples Averaged	Softening Temperature, Deg. F.	Counties
Alum Bed	1	2940	Pike
Dean, Fire Clay or No. 4 Bed	25	+2790	Bell, Knox, Perry
Elkhorn Bed	18	2490	Letcher
Flag or No. 7 Bed	5	2880	Perry
Harlan Bed	8	+2700	Harlan
Hazard, Haddix or No. 6 Bed	4	2460	Perry
Hickory Bed	4	2340	Bell
Jellico Bed	4	2460	Knox
Kanawha Bed	1	2100	Johnson
Kellioka or C Bed	1	2230	Harlan
Lower Bolling Bed	1	2880	Letcher
Lower Elkhorn Bed	2	2740	Letcher
Lower Lignite Bed	3	2440	Bell
Lower Standiford Bed	1	2260	Letcher
Mason or Creech Bed	11	2320	Bell
Miller Creek or No. 1 Bed	13	2160	Johnson, Laurel
Poplar Lick Bed	4	2670	Bell
Rawl, Gas or No. 2 Bed	2	+2680	Pike, Whitley
Upper Elkhorn Bed	3	2420	Letcher, Pike
Upper Hance Bed	4	2330	Bell
Straight Creek Bed	16	2110	Bell
Thacker Bed	1	2430	Pike

FIG. 16. HIGHLY MAGNIFIED CROSS-SECTION OF COAL FROM PITTSBURGH SEAM

Showing constituents of attritus in detail; spore exines in white; humic matter in gray; resinous particles homogeneous gray; and carbonaceous or mineral matter in black.

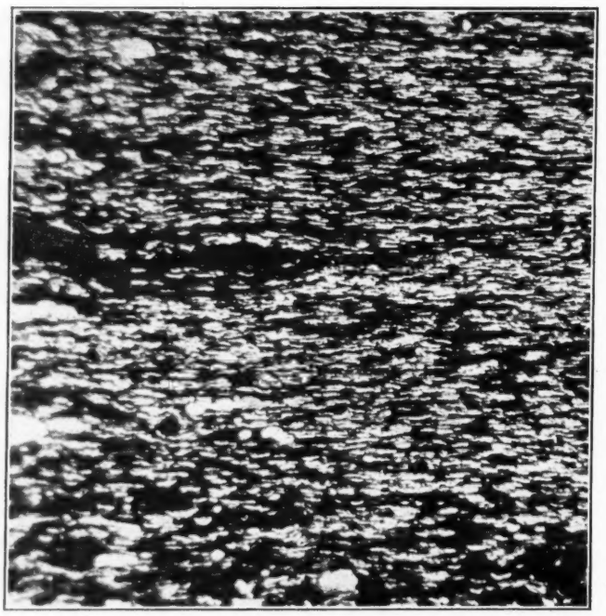


FIG. 17. SECTION OF ATTRITUS FROM PITTSBURGH BED, WHICH IS LARGELY COMPOSED OF SPORE MATTER

burns with a long, luminous flame. It is composed largely of spore exines and similar resinous or waxy products of plants, as can be seen from the photomicrographs. Block and splint are names indicating physical characteristics. Semi-bituminous coal and semi-anthracite represent intermediate ranks of coal between bituminous and anthracite. The classification is based almost wholly on the "fuel ratio," that is, the fixed carbon divided by the volatile matter. The limiting ratios for each rank are given in the following table:

Rank of Coal	Fuel Ratio = $\frac{\text{F.C.}}{\text{V.M.}}$
Bituminous	3 or less
Semi-bituminous	3 to 7
Semi-anthracite	6 to 10
Anthracite	10 to 60

The conventional chemical analysis and calorimeter tests afford much practical information that is useful in the utilization of coal, especially in evaluating it for fuel purposes. These methods, however, do not give any real information as to the constitution and origin of coal. This problem has engaged the attention of investigators for many years. Three different methods of attack have been followed: (1) Treatment of coal with solvents; (2) the destructive distillation of coal; (3) microscopical examination.

Chemists know that resins, waxes and similar substances will dissolve in certain solvents such as benzene, carbon disulphide, pyridine, ether, etc. Hence coal has been treated with many of these fluids in order to dissolve out its waxy and resinous portions and separate them from the purely cellulosic or plant fiber constituents. These researches showed definitely that coal contained resinous matter and also free hydrocarbons. Pictet, Ramseyer and Kaiser[3] extracted 5½ tons of Saar coal with boiling benzene for four days. In the extract they found and identified several pure hydrocarbons as, for example, C_7H_{10}, C_8H_{12} and $C_{30}H_{60}$ (Melene). The last-named compound was identified as the same as the melene obtainable from Galician petroleum.

The volatile-matter determination that is made in the proximate analysis of coal is a typical destructive distillation. The manufacture of illuminating gas and coke depends upon the same process. It is beyond the scope of this paper to describe the multitude of tars, oils, drugs, dyes and materials for explosives and fertilizers that are derived from the byproducts of the coke and gas industry. Fig. 5 gives the names of the more common coal products.

There is a wonderful field for future development in the production and utilization of these byproducts. We already know how to change the relative yield and quality of coke, gas and byproducts by changing the time and temperature of coking. And, as we learn more of the true constitution of various coal—that is, how the chemical elements are combined—we will be able to convert our bituminous coal into far more valuable products. Indeed the time is not far distant when smokeless coke and gas will be the only form in which coal will be burned in cities, and they will then be much more pleasant and cheaper places to live in.

Microscopical Examination

The various compounds obtained from coal on distillation, although not present as such in the coal itself, throw much light on the nature of the compounds from which they must have been derived, more especially when studied in connection with microscopical examinations of thin sections of coal. After all, the best way to find out how a thing is made is to take it apart and look at it. This is what Dr. Reinhardt Thiessen has been doing in the Bureau of Mines' research laboratory at Pittsburgh. Dr. Thiessen has developed a wonderful technique in cutting and grinding sections of coal to such a thinness that it is possible to examine them under the microscope at high magnifications with transmitted light, thus bringing out to plain view structure in coal that has never been suspected.

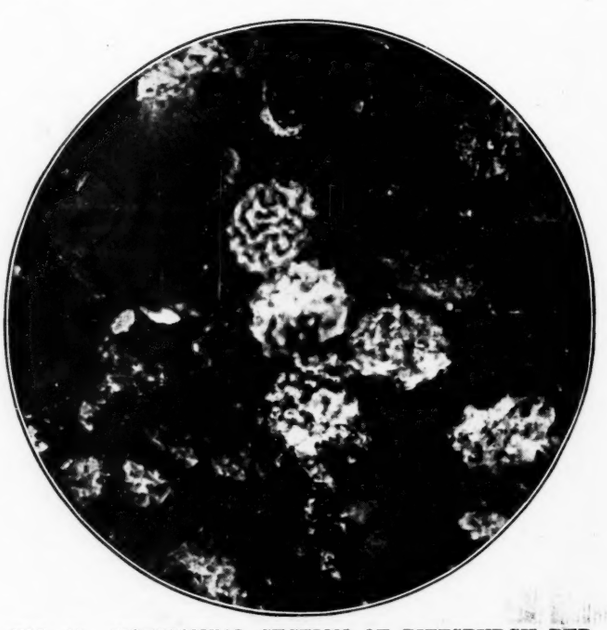


FIG. 18. HORIZONTAL SECTION OF PITTSBURGH BED COAL HIGHLY MAGNIFIED

Showing the convoluted spore that is characteristic of this coal bed and thus far found in no other bed

[3]Pictet, A., Ramseyer, L., and Kaiser, O., Comt. Rend. Acad. Sci., Vol. 163, pp. 358-361, Paris, 1916.

FIG. 19. MEGASPORE EXINES FOUND PREDOMINANTLY IN THE SHELBYVILLE, ILL., COAL AND SPARINGLY IN A FEW OTHER COALS

Dr. Thiessen has recently completed a comprehensive investigation of structure in bituminous coals that contains some wonderfully clear photomicrographs of high-rank bituminous coals. This represents a distinct advance in microscopic study, as these coals have hitherto resisted all efforts to cut or grind them into sufficiently thin sections to allow light to be transmitted through them.

A few typical sections which explain the composition of the bright and dull bands in coal are shown in the accompanying photographs. Fig. 6 is an ordinary photograph of a lump of Illinois coal that illustrates the laminated structure of most bituminous coals. Certain of the layers are of a glossy jet black appearance, others are dull grayish black. The former are usually called "bright" or "glossy" coal and the latter are called "dull coal" or "mat coal." Fig. 7 is a photograph of part of the surface of the block of coal shown in Fig. 6, magnified ten diameters. The "bright coal" is represented by the black bands and the "dull coal" by the lighter striated zones. Close examination of the "dull coal" at this low magnification shows that it in turn is sublaminated into thinner sheets of "bright coal" and "dull coal," the former being largely embedded in the "dull coal."

FIG. 20. GIANT MEGASPORE FOUND PREDOMINANTLY IN THE SHELBYVILLE, ILL., COALS AND SPARINGLY IN OTHER COALS

THE STRUCTURE OF BRIGHT COAL

Now let us examine a thin section of this bright coal under a microscope. Fig. 8 represents such a section magnified 200 diameters. Note the typical cross-grain structure of wood. A great number of bands of bright coal from many different beds were examined in the same way. All of them proved to be derived from woody plant tissue, either of stem, branch or root. The cell structure was well enough preserved so as to leave no doubt that the bright coal represents pieces of wood, large or small, turned into coal.

FIG. 21. ONE OF THE LARGER TYPES OF POLLEN GRAINS

Referring again to Fig. 6, it is seen even at low magnification that the dull coal has a sublimated structure of alternating light and dark bands, and on closer examination we find that the dark bands are "bright coal" embedded in a granular-appearing higher-colored material. And these "bright coal" bands in thin section and high magnification again prove to be woody tissue, that is, instead of being coalified trunks and limbs of trees, as were the large strips of bright coal that are visible with the unaided eye, they are small chips and twigs of wood embedded in a ground mass of vegetable débris, bits of macerated tissue, pollen grains, seed coats, resin particles, etc.

Fig. 9 is a photomicrograph of a section at right angles to the bedding plane of the "dull coal" zone. This is a thin section viewed by transmitted light and is magnified 200 diameters. The woody structure of the large fragment in the upper part of the picture

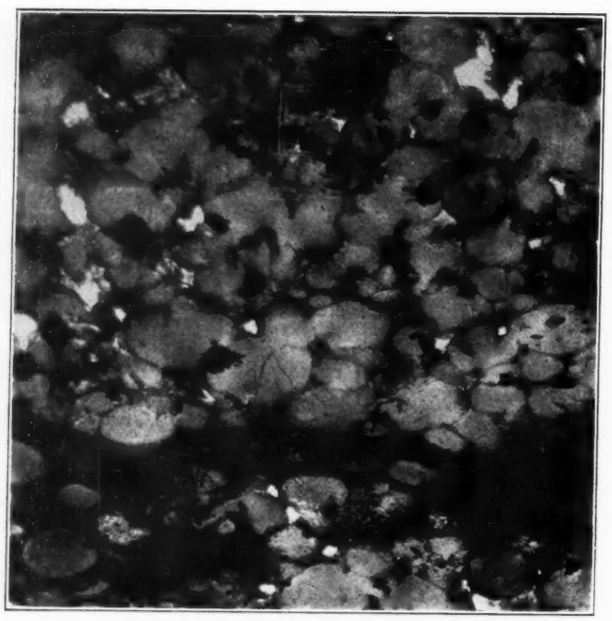


FIG. 22. CROSS-SECTION OF "DULL COAL" FROM THE VANDALIA MINE, TERRE HAUTE, IND., SHOWING A LARGER NUMBER OF RESINOUS PARTICLES

is plainly visible. In fact a large part (and in many bituminous coals the largest part) of the "dull coal" consists of small pieces of woody tissue pressed flat layer upon layer. The surfaces of these chips are readily seen even at low magnification by splitting the coal along the horizontal cleavage plane. Fig. 10 is a photograph of such a horizontal surface. The traces of woody chips are plainly visible.

Origin of the Small Anthraxylon or Woody Components

Dr. Thiessen has named the "bright coal" "anthraxylon," from the Greek *anthrax*, coal, and *xylon*, wood (coal from wood). He explains the presence of such formations in the coal by showing analogous conditions today in a peat swamp containing trees, as shown in Fig. 11. Fig. 12 is a lump of peat from this swamp. It shows a great many thin scaly chips which in the process of coal formation would probably become the thin layers of anthraxylon or "bright coal."

Let us now consider the thin vegetable tissues such as the outermost layers of leaves, green parts, young stems, etc. In many instances these skins, or cuticles, as the botanist calls them, are covered with waxy or resinous matter. They are therefore more resistant to decay and are found in the "dull coal" in the form of very thin layers, as in Fig. 13, which is a section at right angles to the layers. Figs. 14 and 15 also show cuticular tissue readily recognized by the trained botanist.

Between the layers of anthraxylon and cuticular tissues appears at high magnifications a heterogeneous mass of elongated light colored patches, irregular lumps of darker matter, and other débris, as shown in Fig. 16. This material is called attritus. It consists essentially of cellulosic degradation products or humic matter, spore-exines, resinous matter, cuticular matter, and some mineral matter.

Spore-exines are the outer shells or walls of spores of certain plants that contributed to all the coal beds. These spores are found to a greater or less extent in all coal. The attritus of Pittsburgh coal is particularly rich in spores, as shown in Fig. 17. The original spores were spherical in shape. In the coal there remains only the collapsed exine, or shell, which appears in the vertical section as a collapsed ring. In a horizontal section they appear as circular disks, as in Fig. 18. Note the brain-like convolutions of these spores, which is a striking characteristic of the spores of the Pittsburgh coal bed. This particular type of spore has never been found in any other bed.

Figs. 19 and 20 are spores from Shelbyville, Ill., coal and are probably characteristic of this bed, although not enough of the other Illinois coals have yet been examined to be certain that it is limited to this particular coal. Fig. 21 is a large pollen grain from the same coal. Fig. 22 is part of a thin cross-section of anthraxylon coal from the Vandalia Mine, Terre Haute, Ind., showing a large number of oval resinous particles.

The photomicrographs shown in this paper are only a few of many that have been made in the Bureau's laboratory. They represent a vast amount of patient, painstaking work, and have aided greatly in interpreting the results of chemical and geological investigations on the constitution of coal. Much remains to be done. Semi-bituminous coal such as Pocahontas and New River have thus far resisted every effort of the microscopist to produce sections thin enough to permit light to pass through them. Hence we have no direct information on the structure of these coals. The same, of course, applies to anthracite. However, what is impossible today is accomplished tomorrow, and we believe that the story of these coals will be read in the near future just as the structure of the bituminous coal has been revealed today.

Railroad Administrator Orders Change in Demurrage Rates

Of decided bearing to the coal trade is the change in demurrage rates ordered by the Railroad Administration. The statement issued by the Railroad Administration in this connection reads as follows:

Walker D. Hines, Director General of Railroads on June 21 signed Supplement No. 2 to General Order No. 7 referring to demurrage rules, regulations and charges, effective July 20, 1919. The charges at present are $3 per day for each of the first four days, after expiration of free time, $6 per day for each of the next three days, and $10 per day for each succeeding day.

They will be reduced to $2 per day for each of the first four days, after the expiration of the free time, and $5 per day for each day thereafter. The Supplement also provides that the average agreement which at present applies only to cars held for unloading will also be applied to cars held for loading, but the loading and unloading agreement will be separate.

Representatives of the shippers and of the American Railway Association recommended reductions. Mr. Hines pointed out that demurrage charges are not imposed for the purpose of securing revenue but to assist in the punctual unloading and loading of equipment and also that in view of the diminished purchasing power of the dollar and the increasing demand for equipment it was doubtful whether the prompt unloading and loading of equipment could be secured by means of these reduced charges. He referred to the heavy movement of traffic expected within the next few months and announced that if the results were not successful he would feel compelled to increase the demurrage charges.

Some Common Violations of the Mining Laws*

The Chief of the Department of Mines of West Virginia Unburdens Himself of a Few Opinions Regarding Mining Conditions and Safety in Mining, and Enumerates Some of the Reasons for Accidents

RECKLESSNESS and ignorance, according to W. J. Heatherman, who heads the mine inspectors' department of the State of West Virginia, are the chief obstacles to mine safety. The failure to set proper timbers, shooting from the solid, riding on trips, and the lack of adequate facilities for entering and leaving the workings are some more of the causes of mine accidents. Many mine officials, believes Mr. Heatherman, woefully lack a proper conception of their own responsibility and do not attempt to enforce precautionary measures.

TO MAKE the coal mines of West Virginia a safer place in which to work is the main object of the Department of Mines. Recklessness and ignorance are the foes with which we have to contend. They are at the root of every disaster. The mining laws of the state are the safeguards thrown around the men who mine coal. Their enforcement is vested in an inspection force which is continually making inspections of mines, removing hazards and curing defects that appear dangerous to life and limb.

The mine inspector, in reality, is a traffic officer, like the one who stands at the intersection of a busy street and guides the pedestrian on a course of safety. Frequently some reckless individual ignores the warning of the traffic officer and courts disaster by a rash act. The same is true of the warnings of the mine inspector. Familiarity breeds contempt, it is said, and this is most certainly true of the attitude of many miners in the observance of most of the ordinary rules of safety.

The most common violations of the mining laws are the failure of men to set timbers for their own protection, the shooting of coal from the solid, the riding of mine trips and the failure to provide proper methods of ingress and egress to the mines.

The records of the Department of Mines show that 50 per cent. of the accidents in the mines of the state are caused by falls of roof. The majority of these occur between the timber and the face of the coal where the miner has failed to post. It is indeed a common sight to visit a working place and find the miner working from 6 to 16 ft. ahead of the last timbers, while the roof over him is in a dangerous condition.

In reply to an inquiry as to why the miner does not set another prop here and there, you will most frequently receive the same answer—"I will, as soon as I finish loading this car"; or such a query will be met by the assertion that "That's good roof." Pursuing such an inquiry will develop that the miner is without an ax, or if he has one he uses it as though he had never seen that sort of instrument before. The law should require that every miner possess an ax, a good hammer, a slate bar and at least two good wedges, and that he serve as an apprentice or "backhand" for at least six months before he is allowed to work in a place by himself.

Can you imagine a railroad trusting one of its limited trains in the hands of a man who never saw a railroad before? As a matter of fact it is easier to learn to start and stop an engine than it is to be a good judge of roof conditions.

There is not another trade or profession under the sun that does not require an apprenticeship of from one to four years, and often longer. The inexperienced and unskilled miner not only faces unknown dangers, but he endangers the lives of all his fellow workers.

It is essential that every mine should have a well-defined rule as to the location of posts and when the timber should be set. Mine foremen should require strict and uniform observance of this rule.

Frequently, however, mine foremen may be found who do not realize the gravity of their duties. They are content to go from place to place, begging a cigaret here and some carbide there, with an occasional inquiry to the miner as to "When are you going to set that post I told you about yesterday?"

In my opinion, the mine foreman is the most important element in the mining organization. And yet there are some mine foremen who really do not know the way through their own mines. The mine foreman ought to be selected carefully: he is the general in charge; upon him depends the success of the business venture as well as the lives of the men who work for him. He ought to be a clear-headed, intelligent, industrious man possessed of executive ability.

The second offender in the percentage column is mine cars and motors. Next to falls of roof the riding of mine cars and motors by employees in the mines leads to the greatest number of casualties. To lessen the number of accidents from this source no man should be permitted to ride any other than a regularly conducted man-trip. Brakemen should be required to ride on the inside of the empty cars and on the rear of all loaded trips. Couplings should be made only while the trips are standing. Ample clearance should be maintained on the brake side of the car at least, so that a man may pass a moving trip on curves without danger of being caught or rolled against the rib. Another invitation to disaster, which ought to be sufficient cause for suspension, is the practice of standing in the middle of the track and boarding an oncoming trip or train.

The average motorman and brakeman are young fellows, who are often placed in charge of trains without any knowledge of the machinery they handle. They might be called starters and stoppers, or wreckers.

I feel that each motorman should be required to pass

*Paper presented before the West Virginia Coal Mining Institute, Charleston, W. Va., June 4, 1919.

an examination to show that he understands the use and care of brakes, the necessity of good contact, why oil cups are provided, and that he can make just as much speed with his pole trailing as he can "back-poling." I know from experience what means it is necessary to resort to at times (especially on the Monday following the old payday) in order to get all the motors out of the barn. But I believe that such necessity can be overcome to a certain extent by having an occasional meeting with the train crews. You might call it the Knockers' Club, but if you invite them to your office every few weeks and lay before them statistics concerning the number of men they have killed and crippled, the number of cars they have sent to the shop, and what the cost of each locomotive has been, and do it in the proper manner, I believe you will find an appreciative audience and a much-improved set of trainmen. After all, they are only human and a youthful lot, and many of them have not had the advantages of education. These frequent conferences should be advantageous in many ways. No one should be more competent to tell you where to find a piece of bad track or a dangerous roof condition than your train crew. Have your assistant mine foreman present at these meetings and you will be able to discuss and adjust your difficulties, so that when a motor or piece of track is marked for repairs it will be repaired.

The average foreman closes his eyes to boys and men riding huddled between loaded coal cars, and will tell you if you reprove him that he is perfectly willing to go to the next place. Therein lies one great reason for the lack of discipline around the mines today. I would like to suggest that the operators assist in organizing a mine foreman's institute, to be held as often as is necessary to allow each mine foreman in the state to attend and hear qualified men lecture on the duties of a foreman. This would tend to arouse a spirit to overcome the constant and flagrant violations not only of the mining laws, but all laws having for their purpose the elevation of man. The foreman's institute should teach that the same discipline in enforcing the laws should be in effect in every mine in the state.

Solid shooting is one of the most dangerous practices allowed in our mines today. The only remedy I can suggest would be to have the proper section of the mining laws revised so as to require all coal to be undercut, and where it is hand-mined no cuts should be shot down until some official has made an inspection.

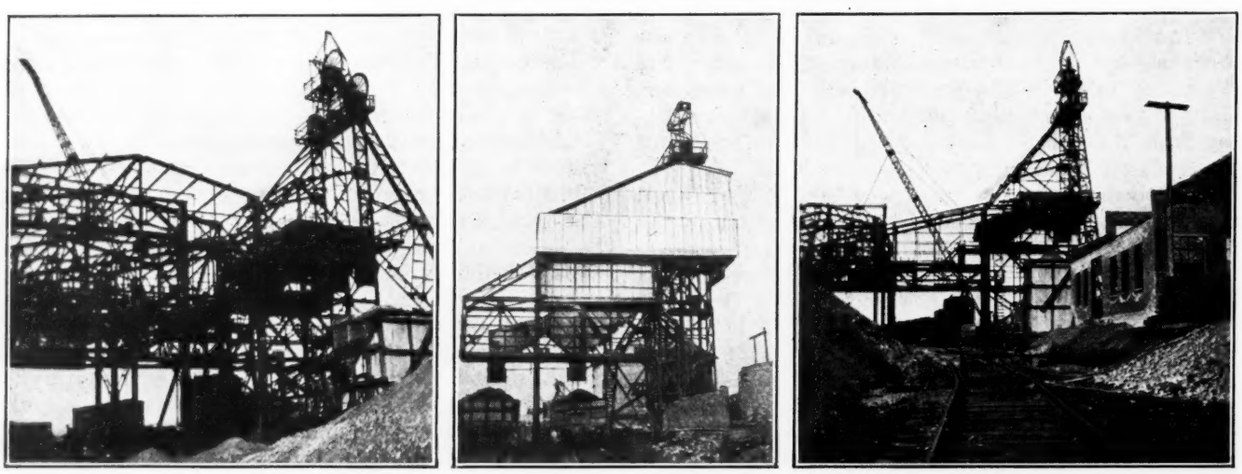
It may be contended that solid shooting "bats out of turn," for the reason that so many accidents are traceable to it. I think many slate falls are premature for the reason that the strata are fractured by overcharged holes, and there is little doubt that several of our largest explosions have been the result of blowout shots or were caused by shooting from the solid.

Where solid shooting is permitted the use of black powder should be avoided. In fact I would like to see written on the statute books a law forbidding the use of black powder and fuse inside the mines of West Virginia. Where men are permitted to use permissible explosives and fuse they will invariably resort to the use of short fuse. There are only two ways to eliminate the hazard. One is by legislation, as I have suggested; the other is for the company to refuse to handle fuse. If the miner were made to realize the amount of money he would save by properly placing and tamping his holes, as well as the danger in which he places the lives of his fellow workmen, I really believe he would readily accept the electric firing and submit willingly to the adoption of permissible explosives.

I regret to say that many of our mines pay little attention to their traveling ways. In fact there are dozens of operations at the present time where one must be both an expert swimmer and climber in order to reach the outside, if he leaves the main haulage road. In many instances I have found the main hauls so badly gobbed that one either had to flag the trip or outrun it if he did not care to be crippled.

I venture the assertion that half the foremen in the state do not travel their returns more frequently than every six months. Every foreman should keep such returns in shape for men to traverse at all times, and should insist upon manholes as required by law.

In conclusion, permit me to make the suggestion that foremen pay occasional visits to adjoining mines where the accident rate is lower, or go from county to county to make inspections and see what methods are being employed in other mines to make them safer for life.



THREE VIEWS OF THE TIPPLE OF THE VALIER COAL CO., VALIER, ILLINOIS

From left to right the views are of the main shaft under construction, the air shaft where men and material are handled, and a second view of the main shaft under construction. The mine will be one of the largest and most modernly equipped in the state. Its capacity will be 7000 tons per eight-hour day. It is electrically equipped throughout. The haulage is by means of storage-battery locomotives. Both shafts are arranged for hoisting, the air shaft being provided in the tipple with a rotary dump, which handles a 4-ton mine car. The main shaft is equipped with a 12-ton double skip hoist, with a modern rotary dump at the bottom. Edison storage-battery cap lamps and other safety appliances will be used.

Underground Motor Repair Shop

By Ralph W. Mayer
California, Pennsylvania

A LARGE company that has immense coal mines does its motor repair work underground. The shop used for this purpose is situated over four miles from the tipple. It is 50 x 18 ft. in size. The roof is shot down to give it a height of 15 ft. and the sides and ends of the room are lined with heavy stone walls. The roof is supported by steel rails, over which is placed sheet steel, the space between the roof and the sheets being filled with concrete.

A track runs through the shop. Underneath the track has been taken up and a motor pit having a depth of 6 ft. has been built. Both ends of the pit are provided with steps made of concrete. The sides and bottom of the pit are constructed of the same material as is also the floor of the shop. Eighteen inches from the pit bottom the side walls have an offset of 4 in. Short lengths of plank can be placed upon these offsets, forming a platform to work upon. The side walls of the shop, near the roof, have an offset on which a steel rail is fastened. A Cleveland electric crane travels upon these rails and will reach any part of the shop floor. It is operated by a small motor. The side walls only partially support the roof, as the steel rail roof beams are set into deep hitches at the side.

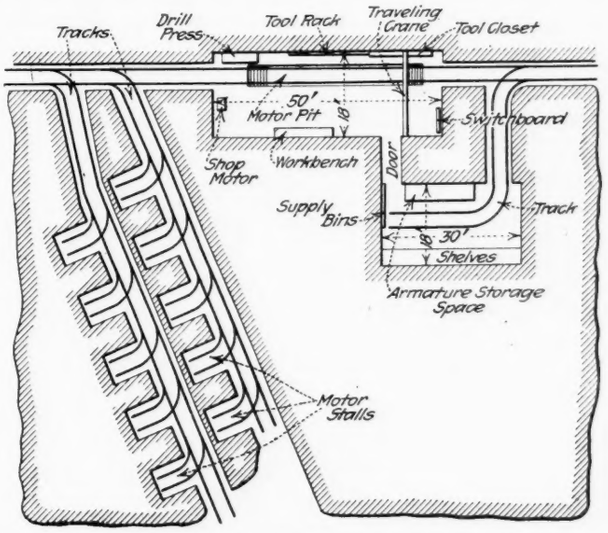
One corner of the shop contains a drill press, an emery wheel and other small machinery. The power for driving these tools is furnished by an electric motor, which is placed overhead at the end of the shop, out of the way. The pit is located at one side of the shop. Racks along the wall on this side hold the wrenches and other necessary tools. A closet on the same side near the end of the shop, provided with doors and locks, furnishes a storage place for the smaller and more valuable tools. The switchboard is placed in the opposite corner. The work bench, equipped with a vise and other appliances, is placed at the side of the room opposite the pit. The entrances to the shop are closed with sliding steel doors, hung on rollers. These are of course provided with locks. The motors are re-wheeled in this shop, and other necessary repair work is also done here.

A storage room adjoins the shop, being separated from it by a pillar of solid coal. A passage way through this pillar, which connects the two rooms, is also closed by a steel door. This storeroom is 30 ft. by 18 ft., but only the height of the coal, or about 7 ft. It has a solid rock roof, while the sides are lined with brick walls. A track also traverses this room, which is also closed by a steel door.

One side of the room is provided with racks for the storage of armatures, field coils, etc. Electric heaters placed underneath this rack keep these spares absolutely dry. Both rooms are entirely free from water. Shelving along the opposite side of the storeroom is filled with spare parts for motors, pumps and other machines. The framework supporting the shelves is made from 1½-in. pipe. Clamped fast to the pipe are pieces of L-shaped iron which support the steel sheets used for the bottom of the shelves. The L-shaped irons are also used to separate the contents of the different compartments. Along the ends of the room also are supply bins. The passageway between the two rooms contains a desk where the records of the repair shop and of the storage are kept. Work is done here on all the haulage, pump and fan motors, as well as the repairs on the pumps. All spare parts have to be kept here, as well as supplies for the mechanics, such as tape, sandpaper, lamp globes, etc.

The locomotive stalls are close to the repair shop. All these machines have numbers painted on their sides with white paint, and each stall has a corresponding number painted at its entrance with an arrow pointing into the stall. At the end of every shift each motor must be placed in the stall having the same number as the motor.

The company has 44 haulage motors in this one mine, all of which are placed in their stalls at the end of the shift. They are then overhauled by the mechanics of the repair shop. Two shifts of mechanics are employed for this service. A split point throw switch is placed at the entrance to each stall. Pillars of coal separate the stalls, which are long enough and wide enough so that there will be several feet of clear space around the motor when it is in place. The repair shop also cares for the repair work on the 35 pumps employed in the mine.



LAYOUT OF AN UNDERGROUND REPAIR SHOP

These are usually repaired where they are installed in some new location, the mechanic taking the packing or repair parts to the pump. Any haulage motor breaking down during the day is brought to the shop and immediately repaired if the injury is not too severe. Any of the stationary motors giving trouble are reported to the shop, and a mechanic sent at once to locate and repair the difficulty.

Having the repair shop and mechanics right at the center of gravity of the haulage system, so to speak, saves time. Placing the motors in their stalls at the end of the shift and having them inspected and if necessary overhauled by mechanics forestalls breakdowns, and keeps the machines in good shape thus reducing repair expenses. This constant care also lengthens the life of the locomotives.

The British Government is spending $750,000 in a large experimental plant in which near-coke will be manufactured by subjecting coal to low-temperature distillation.

The Plastic-Arc System of Welding*

ELECTRIC welding fooled the officers and men of the interned German ships. They had smashed the cylinders and other parts of their engines until they believed they were beyond repair. However, the engines were repaired in place, and the vessels did good work in the transportation of American troops. Electric welding has its application in coal mining, but for arc-welding purposes a suitable welding metal is as necessary as a proper electrical outfit.

By J. O. Smith
New York City

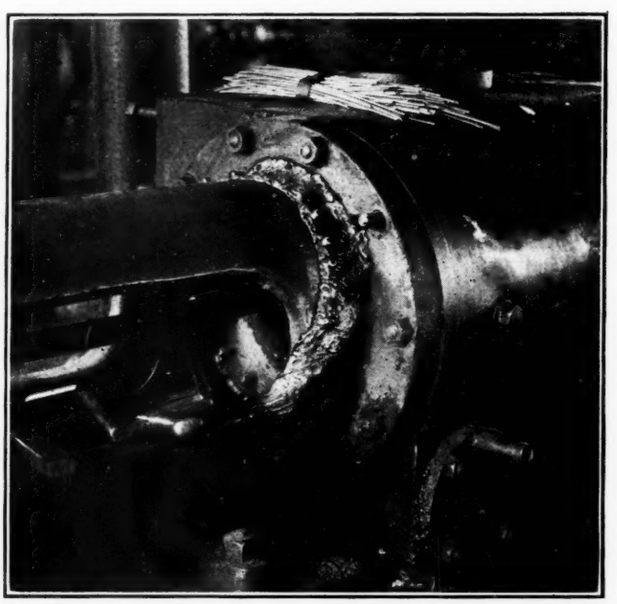
ELECTRICITY as a means for the joining of metals, in repairing cracks or breaks, salvaging defective castings and for metal-cutting purposes, all included under the general head of electric welding, although comparatively simple in theory has been slower in development in the coal-mining field than in any other service in which it has been applied. This slow growth probably arises from two causes—the scarcity of skilled operators and a dearth of reliable apparatus suitable for performing the actual operation.

During the last two years, however, arc welding has made great strides. Undoubtedly one of the means whereby it has attained greater prominence, and the confidence of the engineering world in general, was the successful welding of the damaged parts of the interned German ships at the outbreak of the war in the spring of 1917. The work that was done on the damaged engines of these ships demonstrated to the engineering world in general that electric welding could be depended upon to make permanent repairs, no matter how large or bulky the part to be welded, or what was the character of the metal.

There are four general fundamental types of arc-welding outfits in general use—constant potential, with fixed resistances; variable potential, rising and falling inversely as the current rises and falls; constant current (all of these employ direct current) and the alternating-current type, with reactive control. The constant potential system is the oldest of those employing direct current. It operates on a generator potential of between 35 and 40 volts and uses 18 to 22 volts at the arc for actual welding.

A distinct advantage of low voltage at the arc is that it renders it impossible for the operator to draw out a long arc between the electrode and the work. The deposition of clean, sound metal resulting in a good weld is largely a question of the operator's skill in maintaining a short and even arc, which eliminates oxidization of the molten metal by the air and insures the metal being deposited in the correct place. The voltage across the arc increases as the arc lengthens, and if the voltage is too low to maintain anything but a correct length of arc it follows that the operator has a surer indication (when his arc begins to weaken) that he must shorten the distance between his electrode and the work. With a low-voltage supply the external appearance of a weld is a certain guide to its value, and it can be safely reckoned to be free internally from any dangerous slag or oxide inclusions.

In the variable potential system, the current and voltage balance one another to a certain extent, the current varying principally with the length of the arc and maintaining its greatest stability when the arc is of considerable length. The long arc, however, is not generally advocated, because of diffusion at the surface of the original metal, and because of the tendency of the original metal to become porous and also to oxidize. The constant-current system is used primarily for single-arc outfits, although arcs in series can be used.



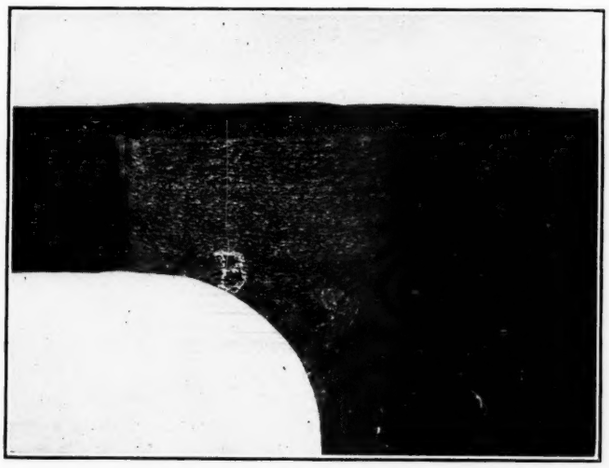
WELDING REPAIR ON STEAM ENGINE

The steam engine at the Public Service plant in Jersey City, N. J., broke practically in two. It was welded and put back in service by the plastic-arc system

Because of the alternations of the current, it is practically impossible to draw a long arc in the alternating-current system, and further, because such an arc is much more sensitive to variations in its length than in direct-current systems a higher voltage is necessary to steady it. Coated electrodes are used with the alternating system.

In the Wilson plastic-arc system, which comes, of course, in the constant potential class, the power lost in the line and in the automatic current regulation is of

*Abstract of a paper presented before the first meeting of the Coal Mining Electricians and Mechanics Institute, Charleston, W. Va., May 30, 1919.



COMPLETED WELDING REPAIR ON A BRAKE

low value compared to the energy actually required for welding. There is consequently a great saving over systems employing higher voltage. The low voltage used (18 to 22 volts at the arc) also insures better penetration of the original metal by the concentrated arc than is true when a longer, diffused arc of higher voltage is employed.

The comprehensive repairs necessary in the case of the damaged engines and other parts of the interned German ships definitely determined that any welding system, to be considered available for such heavy work in cast iron or cast steel, must deliver and maintain a critical degree of heat at the weld, in order to insure proper fusing of the original and the added metal.

This condition is successfully accomplished by means of a standard flat compound 35-volt generator feeding a special constant-current controller. The carbon pile and a solenoid that operate the arc are in series with it, so that the current through the arc is controlled by the automatic variation of the resistance of the carbon pile in response to the pull of the solenoid. The pull of the solenoid is balanced in turn by a spring acting through a leverage system, and the current adjustment is made by changing the leverage. The pilot motor, which is controlled by a switch at the welding-tool handle, regulates the leverage so that the operator can change the current at the arc, if necessary, without leaving his work or extinguishing the arc. This is a desirable feature in ship or general welding repair work.

The subject of the repair of the interned German ships brings up a matter that assumes greater and greater proportions the further consideration of it goes. It must be remembered, first of all, that some of the largest and fastest ocean steamships afloat were included among those deliberately damaged by their crews to prevent their use by the United States as transports, and that these same vessels eventually carried one-quarter of the total American expeditionary force to the battle fields of France, just in time, as we all know, to be where they were badly needed to stop the onrushing Hun. Had the repair of these ships not been effected as promptly as it was, there is no telling how much bearing the belated arrival of our troops on the firing line might have had on the final result. For all we know, the war might still be going on.

Part of the annual report for 1918 of Secretary of the Navy Daniels, which has a distinct bearing on this phase of the matter, is as follows:

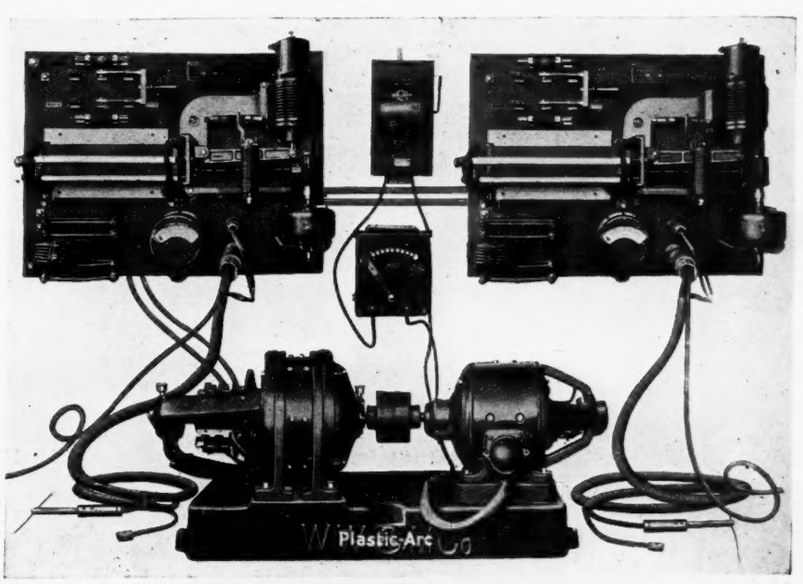
When war was declared with Germany all the German ships lying in our ports, many of them of the highest class of transatlantic passenger steamers, were immediately taken over by our Government. Upon examination it was found that the machinery of all of them had been deliberately damaged by their crews, in many cases seriously, and the character of the injury was such as to denote that the work had been carried out under a central direction and that it had been well planned.

When taken over, these ships, to the number of 103, were put under control of the Shipping Board, which later transferred 34 of them to the Navy for use as troop and freight transports, and subsequently added 20 more to be repaired and returned to the board.

The principal damage was the breaking of cast-iron parts of the main engines, chiefly the cylinders, though in one case rods, connecting-rods and boiler stays were sawed half in two, and in others the boilers were ruined by dry-firing and had to be renewed. There was, in addition, much vandalism of a minor character, but the remedying of this was insignificant in comparison with the gigantic task of repairing the cylinders, some of which were more than 9 ft. in diameter.

It was speedily recognized that the large passenger ships thus taken over would have to be our chief reliance in transporting troops to France, and their quick repair became a matter of great national interest. After a survey by representatives of the Shipping Board, which at the time had custody of them, it was decided to make new cylinders. This decision was in accord with usual practice and also with the rules of the marine underwriters, and but for the number of ships and the large number of cylinders involved would probably have been followed. But the time required was prohibitive, and while the subject was under discussion a few of the ships were transferred to the Navy and sent to the New York Navy Yard for repairs.

As the Navy was not bound either by previous practice or the rules of marine insurance societies, the engineer officer of the yard, Capt. E. P. Jessop, U. S. N., after conference with an electric welding company recommended that the broken cylinders be repaired by welding, and in



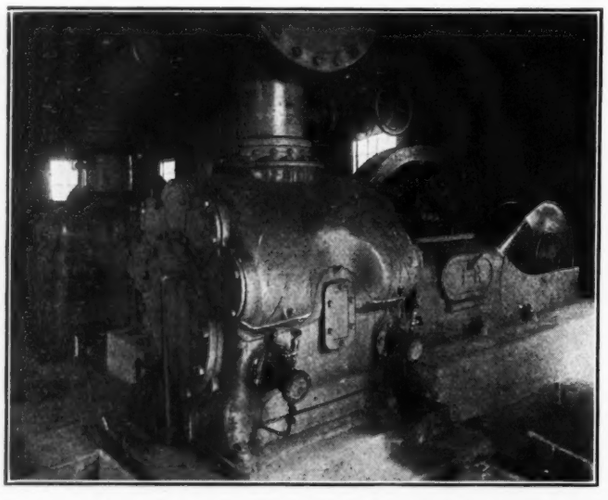
NECESSARY ELECTRICAL OUTFIT FOR WELDING BY PLASTIC-ARC PROCESS

this he was heartily supported by Rear Admiral Burd, the industrial manager of the yard. The matter was referred to the Bureau of Steam Engineering, and Capt. O. W. Koester, assistant to the bureau, was directed to make a thorough examination of all conditions on the ex-German ships. As a result of his investigation, orders were issued to make all repairs where possible by electric welding, and to resort to mechanical patching only where welding was impracticable, and the department supervision of the work was thereafter under the personal direction of Captain Koester.

This decision, so far-reaching in its application and so fraught with danger to the professional reputation of the officers concerned, was made in the face of opposition by engine builders and by marine insurance companies, but with such confidence in the ultimate result as left no room for doubt of its success. Electric welding was well known but its application on such an extensive scale was unprecedented; by its use these damaged cylinders could be saved, the work could be done without removing the cylinders, and all the vessels could be made ready for service probably a year before they could have been if the cylinders were renewed.

Upon completion of repairs, which were carried out uninterruptedly for 24 hours a day, each vessel was sent to sea for a test under full-power conditions for 48 hours, the purpose being to ascertain whether the work of repair had been well done and to determine whether the ships were in condition to be intrusted with the transportation of troops. So well and so successfully were the repairs accomplished that there was not a single instance of a defective weld, nor has one developed during the months of arduous service on which these ships have been engaged.

I have entered upon so full a statement of this case because I think it stands out as one of the greatest engineering achievements of the period. The perpetrators of the sabotage were confident that they had damaged the machinery of these ships beyond repair, which fact is evidenced by a memorandum found on board one of them, in which each case was carefully noted, followed by the significant remark, "Cannot be repaired"; and the speedy rehabilitation of these vessels in the face of such German confidence is a splendid triumph of American ingenuity and an evidence of American engineering accomplishment that is deserving of the highest commendation. The restoration of these magnificent ships to service reflects the greatest credit upon the naval officers concerned and upon the officers and employees of the welding and engineering companies who carried out the work. It is an illustration of the part played in winning the war by men who handled an electric torch or who fashioned and secured mechanical patches to these damaged cylinders. Without these ships we could not have transported our troops to France as rapidly as was done, and the men who made this possible performed a service of as high an order as have the brave boys who were thus enabled to take their place on the fighting line.

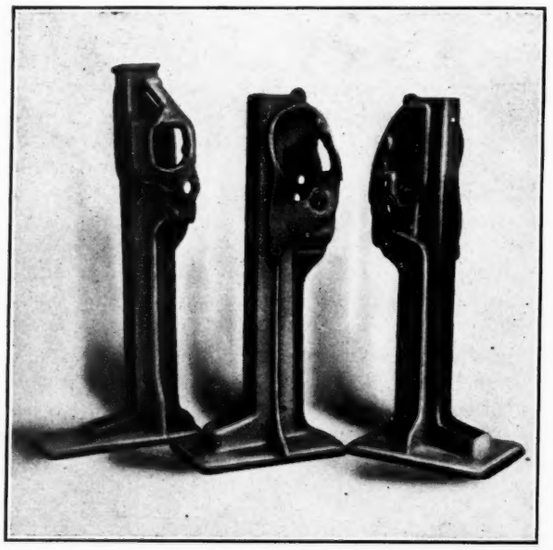


CAST-IRON ELECTRICALLY DRIVEN AIR COMPRESSOR REPAIR

This compressor, at the plant of the New Jersey Zinc Co., at Ogdensburg, N. J., was cracked in several places, due to a fire at the plant. It was repaired in place by the plastic-arc welding method

As a sidelight on this work it has been made the subject of careful estimate and determination that the repair of these ships resulted in a saving of 12 months in time, enabled us to transport at least 500,000 troops to France, and effected an economy which is conservatively estimated at upward of $20,000,000.

It will be recalled that for a few days previous to the declaration of war, the newspapers of the country had printed articles about mysterious doings and noises aboard the German ships then interned in our ports. These articles told of sounds of heavy pounding being heard throughout the days and nights on board these ships, and of splashes during the nights as though heavy pieces or parts of machinery were being thrown overboard.

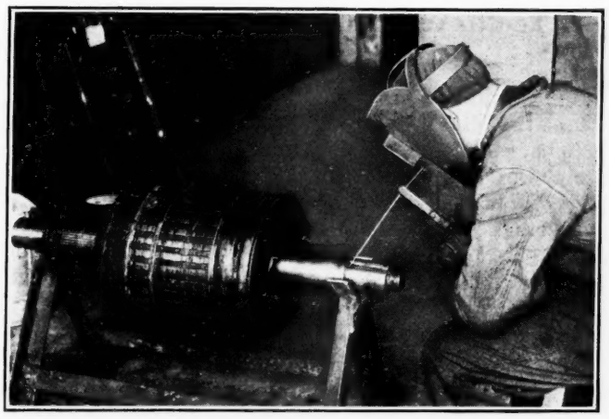


BROKEN JACK STANDARDS RECLAIMED FROM SCRAP PILE BY WELDING

It was not known then, of course, to what extent we had to deal with *Kultur* and its refinements, and we did not realize the lengths of infamy and destruction the Hun would resort to; but after the vessels were taken over, it was discovered that the pounding was the result of driving tapering wedges into holes previously drilled into cylinders and other parts of the interned ships. The result was, of course, that huge pieces of metal were broken out of all the important parts of the ships, and these pieces were thrown overboard.

Some of the German officers of these ships have declared, since the war, to Americans with whom they came in contact, that when they damaged these ships they thought they had made them impossible of repair. The fact that 9-ft. cast-iron cylinders could be repaired by welding seemed beyond their understanding. They stated that although the Germans had experimented extensively with all sorts of welding, they could not weld cast iron of such bulk.

On the cylinders of the 20 vessels of German origin, exclusive of the turbine-driven "Leviathan," formerly the "Vaterland," there were 118 major breaks which would have entailed the renewal of some 70 cylinders if



REBUILDING THE PINION END OF AN ARMATURE

ordinary practice had been followed, as was the recommendation of the surveying engineers in their original report. However, a group of five electric-welding experts inspected the damage and reported that all the cylinders could be saved by welding. A fact of great importance to the marine engineering world is that all the cylinders were thus saved, the ships were quickly made serviceable and another calculation of our enemy was thereby sadly disarranged.

To any one familiar with conditions at that time in the machine shops and foundries in the vicinity of New York, also in the drafting rooms, the problem of producing 70 cylinders of the size required by these vessels would have seemed almost impossible, and it is fairly well established that some vessels would have had to wait nearly two years for this equipment.

It must be remembered that few drawings of these engines were available, and those in many cases were not discovered until months after the repairs had started. Therefore, it would have been necessary to make drawings from actual cylinders, and competent marine engine draftsmen who were not already flooded with work did not exist at that time.

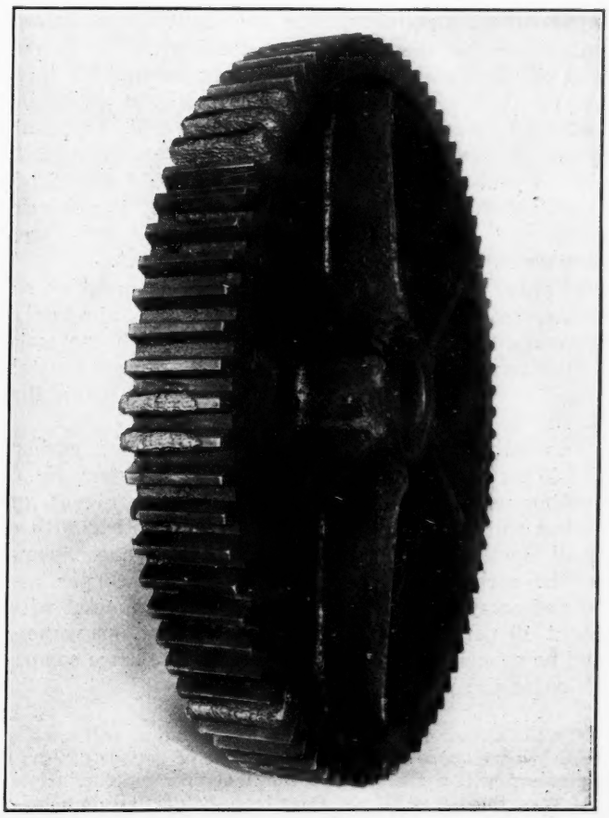
The break in the starboard high-pressure cylinder of the North German Lloyd steamer "George Washington" was typical of the damage done by the Germans. This break was effected by boring a row of holes in the cylinder wall, about an inch apart, and knocking a piece of the wall out with a ram.

To prepare this for welding it was necessary to chisel off the surface roughly, build a pattern of the break, cast a steel piece from the pattern, stud up the surface of the cast iron of the cylinder with a staggered row of steel studs $\frac{5}{8}$ in. in diameter projecting $\frac{1}{2}$ in. from the cylinder, bevel the edge of the cast piece, place the piece in position, and make the weld. A pad of metal was sometimes laid over the rows of studs previously mentioned. Tests have shown conclusively, however, that such welds can be properly made without this pad; that is, if the approximate strength of the original metal is all that is desired. In such a case the studding of the metal is unnecessary. In these particular cases the work was of vital importance, because of the uses to which the vessels were to be put when in service. Furthermore, it was appreciated that this exhibition of a new application of the art of welding required that the demonstration be satisfying, not only to the mind of the engineer, but to the eye, and ear. And when any engineer looked at the band of metal formed by the pad and sounded it with a hammer, he could not fail to be satisfied that the necessary strength was definitely there.

Capt. E. P. Jessop, of the Navy, personally tested many welds in which cast iron was joined to cast steel for tensile strength and noted in but one case a failure to obtain practically the original strength. This one case showed the effect of an inexperienced operator burning the metal. It was easily detected as an inferior weld without the test being applied.

The electric-welding operation consists in connecting the positive leg of the circuit to the part to be repaired, and the negative leg to the holder in the hand of the operator, placing the welding wire in the holder and bringing it sufficiently close to the casting to strike an arc. The welding wire then melts to a plastic state and fuses to the casting, which is also in similar state from the heat of the arc. The metal is laid on in layers in such a manner as to take care of the contraction in cooling. Each successive layer is cleaned with a wire brush before the next layer is applied. In the keeping of the successive layers clean and in laying on the metal so as to take care of contraction the operator's ability is exercised quite as fully as in the handling of the apparatus.

The cylinders of the German engines were not removed, but were repaired in place. Thus the work of fitting was reduced to a negligible quantity, and the refitting of lagging was not interfered with by projections, other than the $\frac{5}{8}$-in. pad, which was laid over the studs for extra strength. It may well be noted that such repairs can be undertaken at any place where a vessel may be lying, either at her loading dock or in the stream, since welding apparatus may be carried on



RENEWING TEETH IN A DAMAGED GEAR WHEEL

barges which can be placed alongside and a wire run to the work.

In the early days of arc welding attention was directed solely to developing the machines employed in the operation and little thought expended on the welding metal itself, or how it should be used to attain the best results. The result was that a large percentage of the attempted welds were failures, principally because of the change in characteristics of the welding metal from the effect of the heat in the arc.

This particular phase of welding has been made the subject of special study by laboratory engineers, with the idea of developing a welding metal that would hold its proper characteristics through the intense heat of the arc. It was determined after long experiment that no one welding metal could be developed that would insure lasting holding qualities in work on a variety of metals.

The result was that a number of special welding metals were developed and these were experimented with, analyzed and further developed, until the special welding metals, known as Plastic-Arc certified welding metals, were finally evolved. These special welding metals, of which there are eight grades, are made up in the form of welding electrodes.

In order to insure proper tensile strength and ductility it is necessary that the welding metal possess the following qualities: (1) The wire must flow evenly with good penetration. (2) The metal added must compare favorably in its composition with the parent metal.

In welding with an ordinary soft iron electrode on a metal part that contains about 20 per cent. (so called) of carbon and 45 per cent. of manganese, the deposited metal is practically pure iron and does not penetrate the weld.

The parent metal is plastic for about $\frac{3}{16}$ in. below the surface and the electrode is added while it, too, is in a plastic state. When a sufficient amount of this incorrect welding metal has been deposited at a certain point, the operator moves the arc along and the metal quickly hardens, leaving a sharp line between the parent and the added metal. The result is a weld devoid of holding qualities or the tensile strength of the parent metal, and failure is certain to occur the first time undue stress is imposed on the welded part.

In order to insure a tensile strength as great as or greater than that of the parent metal, it is absolutely necessary that the welding metal be of such composition as to retain the characteristics of the parent metal after the welding metal has been passed through the intense heat of the arc.

In welding parent metal of about 18 per cent. carbon and 45 per cent. manganese, by the Wilson system, No. 6 welding wire is used. This contains 22 per cent. of carbon and 75 per cent. of manganese, together with a small amount of copper. Part of the manganese, some of the carbon and practically all of the copper are burned away in the arc, leaving the added metal with about 19 per cent. of carbon, 50 per cent. manganese and no copper, which is approximately the same composition as the parent metal.

THE COAL sample of higher moisture content will usually occupy more space for the same number of pounds of (dry) coal than will a sample of lower moisture content. However, the Bureau of Mines states that the increase in volume for the wet coal is not so great proportionately as is the increase in weight per cubic foot.

Tenth Annual Meeting of the Mine Inspectors' Institute

THE tentative program of the tenth annual meeting of the Mine Inspectors' Institute of U. S. A., which is to be held at Indianapolis, Ind., July 8, 9 and 10, 1919, promises to be most interesting and profitable to those who will attend. The headquarters of the Institute will be located at the Claypool Hotel, and meetings will be held at the Legislative Chamber, State Capitol Building, and the hotel proper. The ladies attending have not been forgotten, for they will be given the privileges of the parlors of the Claypool Hotel, and their entertainment will be in charge of a local committee.

As announced, the program is as follows:

TUESDAY, JULY 8, 1919

10:00 A.M., State Capitol—Address by Hon. James P. Goodrich, Governor of Indiana; Hon. Philip Penna, Indian Coal Operators Association, and Hon. William Green, United Mine Workers of America.

Response by members of the Institute.

Business Session—Acceptance of new members, etc.

2:00 P.M., Palm Room, Claypool Hotel—Address by the President, Thomas Graham.

Discussion.

Indiana State Mine Inspection Service, Its Aims and Hopes, by Cairy Littlejohn, Chief Deputy Mine Inspector of Indiana.

Discussion.

Address by Prof. C. J. Norwood, Chief Inspector of Mines for Kentucky.

Question Box and Discussions.

8:00 P.M., Smoker—

Round table conference.

WEDNESDAY, JULY 9, 1919

10:00 A.M.—Palm Room, Claypool Hotel—Compensation Insurance as an Aid to the State Mine Inspector, by J. G. Vaughan, District Mine Inspector of West Virginia.

Coöperation Between State and Insurance Inspectors. by H. M. Wilson, The Associated Companies.

Discussion.

Question Box and Discussion.

2:00 P.M.—A Method of Humidifying Coal Mines to Prevent Coal-Dust Explosions, by J. W. Paul, Mining Engineer, U. S. Bureau of Mines.

Discussion.

History of the Mine Inspectors' Institute of the U. S. A., by Prof. J. T. Beard, Senior Associate Editor, *Coal Age*.

5:00 P.M.—Automobile ride through Indianapolis, leaving from Claypool Hotel.

8:00 P.M.—Business meeting.

THURSDAY, JULY 10, 1919

Visit some Indiana coal mine, place of visit to be announced on July 9.

CARBON IGNITES at about 900 to 1000 deg. F. Therefore, in burning pulverized coke or anthracite in furnaces it is necessary to use special expedients to raise the temperature of the burning fuel above the ignition point. Low-volatile fuels have been burned satisfactorily by this method.

The Importance of Rail Bonding

By E. Steck
Hillsboro, Illinois

SYNOPSIS — *Locomotives often fail through no fault of design and no imperfection in manufacture, but through improper or inadequate electrical supply lines. The chief difficulty appears to be poor track bonding, which cuts down the voltage delivered to the mine motors. The welded terminal type of track bond appears to give better all around results than other common varieties.*

MANY coal operators and superintendents do not realize the importance of proper track bonding. Excessive numbers of and high maintenance cost on locomotives and cutting machines are often traceable to poor bonding. The full importance of this matter is not apparent until this subject is investigated in detail.

If the theory once expounded to me by an electrician in charge of a large mine were true, bonding would not be necessary. His view was that the trolley was the positive side, which carried the current from the positive brushes of the generator out along the line and into the locomotives and cutting machines. After passing these machines it made no difference what happened to the current, and no return was necessary. If by any chance the polarity of the generators was reversed, it would be impossible to operate the locomotives and coal cutters, as the current would have to flow along the rail, which, not being bonded, would make it impossible to reach the machines.

Of course, this theory is not correct. It is just as important to have good bonding if the trolley is the positive side as it is if the trolley is the negative side. In fact, it is generally highly important to bond properly since the voltage drop may thereby be made to be less over the rails than over the trolley. The voltage of any point in the mine circuit is readily calculable, since it depends upon the amount of current, size of trolley and feeder, rail resistance and the voltage of the generator.

$$\textit{Voltage drop} = \frac{10.5 \times \textit{amperes} \times \textit{distance}}{\textit{Circ.mil of conductor}}$$

For example: The generators on top develop 275 volts direct current, and we will assume that there is a 15-volt drop in the cables connecting the trolley and rails to the source of energy. The voltage on the bottom will then be 260. If the voltage at a parting 3000 ft. from the bottom is desired, when 800 amp. is being used on the entry, and there are 35-lb. 30-ft. rails with bonds showing an average of 4 ft. of rail resistance, and a 4/0 trolley with a 500,000-circ.mil feeder, the calculation is as follows:

$$\textit{Drop in trolley} = \frac{10.5 \times 800 \times 3000}{211{,}600 + 500{,}000} = 35 \textit{ volts.}$$

$$\textit{Drop in two rails} = \frac{10.5 \times 800 \times 3400}{371{,}360 \times 2} = 38 \textit{ volts.}$$

The resistance of the rails in the foregoing is assumed as 12 times that of copper, or the cross-section of 35-lb. rail equals 371,360 circ.mil of copper. A 4/0 trolley equals 211,600 circ.mil. In this case the bond has the effect of making a 30-ft. rail equal to 34 ft. on the basis of resistance; therefore, 3000 ft. of rail would be equal to 3400 ft. when bonded. In other words, the 35-lb. rail well bonded is as effective as a 4/0 trolley plus a 500,000-circ.mil feeder. The voltage at the parting will be 260 — 35 — 38 = 187 volts.

Now take the same condition where the bonding is extremely poor; no cross-bonding; switches not bonded; sections of track without bonds, and good bonding at only infrequent intervals. Under such conditions it is not out of the ordinary to find the average—that is, the total rail joint resistance divided by the number of joints—equal to 60 ft. of rail resistance. In this case the overhead drop will be the same, but the rail drop will be

$$\frac{10.5 \times 800 \times [3000 + (100 \times 60)]}{371{,}360 \times 2} = 100 \textit{ volts.}$$

The voltage at the parting will be 260 — (35 + 100) = 125 volts. The effectiveness is reduced to a little more than that of a 4/0 wire. The result is not only a frequent burning out of locomotive and machine armatures, but the slowing down of all electrically operated machinery. The locomotives will not make as many trips as they should, and the machines will not cut enough coal. It can readily be seen that this poor bonding reduces the output of the mine, and that when the bonding is done efficiently the locomotives will haul more coal and the machines will cut more places. Either the tonnage will be increased with the same amount of equipment or, if it is impractical to increase the tonnage, some locomotives and machines can be dispensed with.

We can easily see that a mine with good bonding saves in the number of machines and locomotives required for a given output. The reduction of the number of machines and locomotives reduces the capacity of boilers, engines and generators, decreases the amount of boiler coal necessary and, in fact, lessens the demand upon all power-plant equipment. There will be a saving in the number of motormen and tripriders that frequently amounts to considerable. There will also be an increase in voltage as the amount of current will be decreased, and from the formula it is noted that the voltage drop is directly proportional to the amount of current required. The cost of bonding, including labor and material, when done well is small in comparison with the benefits derived.

The bond resistance depends on the length of the bonds and the type. A 12-lb. high-carbon rail has practically the same resistance per foot as a 2/0 copper wire; a 20-lb. rail is equal to a 4/0, and a 40-lb. rail is equal in resistance to two 4/0 wires. Main haulageways should have both rails bonded with 4/0 wire where haulage motors, gathering motors and cutting machines are in use. This is especially necessary in old mines where the partings are far back from the bottom. In cross entries it is generally found efficient to bond one rail with 2/0 bonds; however, if some of these cross entries are to be used later as main haulageways, they should be bonded with 4/0 bonds on one rail, and later the other rail may be similarly bonded. It is not

possible to give an empirical formula for bonding, but after the length of bonds has been decided upon their size should be such that when the mine is fully developed the drop will not be excessive.

Often a piece of solid wire is laid along the flange of the rail and clamped to it by spikes driven into the ties, so that the head of each spike presses the wire to the rail. Tests made on 20-lb. rail with 2/0 wire show about 6 ft. of rail resistance when the wire and rail are both clean and the bond has just been installed. A test two months later showed 25 ft., and in six months this bond was found absolutely useless. The apparent explanation is that the locomotives loosen the wire, and the rust on the rail and the oxidization of the copper gradually increase the contact resistance.

Channel pin bonds are a development of clamp bonds with all their troubles, only these take longer to develop. Compressed terminal bonds are and remain effective when properly installed, but it is nearly impossible to have them put in as they should be. In many instances the head of the terminal is too short, making it impossible to do a good job. More often the bond hole is not the correct size for the bond, the hole is not cleaned thoroughly, oil, dirt and dampness being present, and the bond compressor is not used properly, or a hammer is employed in place of it.

With poor workmanship the bond resistance quickly increases and the bond becomes ineffective. Tests made at the time some 4/0 compressed terminal bonds were installed on a 25-lb. rail showed an average resistance equal to 4 ft. of rail. In less than a year this had increased to 15 ft. because of poor workmanship.

How the Hole Should Be Reamed

In order to obtain permanently satisfactory results with this type of bond the hole should be reamed with a taper reamer to such an amount that the bond must be lightly tapped to cause it to enter the hole. Both sides of the web of the rail should be surfaced; all dirt, oil and moisture should be thoroughly cleaned off before the bond is inserted, and a bond compressor should be employed. The head of the bond should be of sufficient length so that a button is formed after it is compressed.

Because of the trouble encountered in getting these bonds installed properly, electrically welded bonds are coming into use. The cost of these bonds is practically the same as those of the compressed terminal type, but the cost of installation is decidedly less. Experiments further show that a bond of this type is permanent.

These bonds may be procured with either iron or copper terminals. While the copper has slightly less resistance than the iron terminal, it is more difficult to weld to the rail. Bonds are made for welding to the ball, web or flange of the rail. A short U-shaped bond is used for attachment to the ball. This has the advantage of being cheap and easily inspected, but it car only be used on heavy rails with tight fishplates and where the ties under the rail joints are in good condition. Otherwise such bonds will be cut off.

The same bond can be used underneath the flange, but one serious objection is that it cannot here be inspected readily; also on old track generally the ties must be changed. This makes the cost prohibitive. The most satisfactory method for the average track is to use the straight bond, 10 in. longer than the fishplate, and weld it to the upper side of the flange on the inside of the rail so that it passes just underneath the bolts. This method gives maximum protection in case either cars or locomotive leave the track, and it can here be easily inspected.

The objection to using this type of bond and welding to the rail web is the liability of burning the web and damaging the rail. With a gang of three men, one to do the welding and the other two to prepare for the weld, 15 to 20 bonds may be put in place per day when all hands are absolutely new to this work. With about two months' experience they can easily put in 60 per day. This is on an eight-hour basis and must take into consideration the fact that work is often interrupted to permit the passing of locomotives. The average for putting in concealed compressed terminal bonds under like conditions is about 15 per day for two men. On a test using 35-lb. rail and 28-in. 4/0 bonds of the welded type, the installation gang showed an average of 100 bonds per day. A test made a few months later showed no change in resistance.

Importance of Bonding Switches

Even when bonds are properly installed it is important that the bonding progress with the track extension and that relayed track be bonded at once. In many instances considerable trouble is taken in bonding a straight track and no attention paid to switches. Special precautions should be exercised in bonding switches, as neglect to do so, especially where there are no cross bonds, is to make the work done on the straight track useless.

The advantage of cross bonding is that should a rail joint have especially high resistance because of a defective bond, the current will take the other rail on the cross bond just before this fault, and again return on the next following cross bond. Consequently, cross bonds should be installed about every 200 ft. They should be about 10 in. longer than the gage of the track and should be buried in the ground close to a tie in order to protect them from injury.

Return feeders frequently are placed along the track and only tied to it at the end of the feeder. The effectiveness of the feeder will be greatly increased if it is tied into the track about every 200 ft. This materially decreases the length of the electrical circuit as the locomotives come into the bottom; or, in other words, it increases the voltage at the locomotive. Care should be taken to solder the feeder and either weld the other end to the track or bond to it by means of compressed terminal bonds; cross bonds cut in half are convenient for this service.

In proving a coal property preliminary to development, often a number of drill holes are put down which serve their usefulness when the desired depth has been reached and a record obtained of the material drilled. Later when mining has opened up territory including these old drill holes, it often happens that they increase the amount of water to be pumped. The old drill holes may have gone through crevices, fissures or seams of watery strata, and it is desirable to stop the flow into the mines. A number of methods have been used to plug such drill holes, operating from the surface. However, a simple method of plugging the hole from the underground workings is as follows: Fill small bags with concrete and push them up into the hole one at a time, the diameter of the hole determining the size of the bag used, as ultimately they must be wedged tightly into the drill hole. When no more concrete can be forced into position the bottom of the hole is plugged with a soft pine stopper, which can be supported temporarily in position until the concrete sets.

Navy Rejects Bids for Steam Coal

The Navy has rejected all bids submitted for steaming coal for the coming fiscal year and is continuing its requisition of coal on a pro rata basis at a price of $3.08 per gross ton. Some question has been raised as to the authority of the Navy to secure coal in this way after the signing of the peace treaty. Some operators are of the opinion that the Navy made a mistake in not accepting the bid, since the operators, under the requisition plan, may sue if they are not satisfied with the price, and it is believed that the Navy will pay a much larger amount for its coal than would have been the case otherwise. In connection with the refusal of the bids, Secretary Daniels issued the following statement:

Failing to secure tenders of enough coal to fuel the troop ships bringing the Army back from abroad, the Navy has found it necessary to provide an adequate supply of satisfactory coal, primarily for use on vessels engaged in the return of troops and other purposes afloat, to continue the issuance of Navy orders, as is being done in the case of current deliveries.

Under a recent issue of proposals soliciting competition for the furnishing of steaming coal after July 1, definite offers were received for only about one-half of the quantity requested, some of the largest operators offering only a meager supply and some having failed to submit a bid.

At Hampton Roads and New York, two of the principal points of supply, the tonnage as offered was less than one-half and one-third respectively of the estimated requirements.

The coal situation, as reflected in the Navy's recent bids, is viewed as rather difficult of explanation in that recent announcements from persons active in the interest of coal supply have indicated that the reluctance of consumers to buy coal was resulting in more or less concern to the operators, as an increase in demand was needed to provide employment for the miners and the desired increase in production.

The Navy orders just issued will cover the period for six months from July 1, and for the most part provide for prices which are in keeping with the lowest bids received for high-grade coal under the schedules recently published.

Hearing Ordered on Coal Rates to Northwestern Ports

The Interstate Commerce Commission has issued the following statement in the matter of rates on coal to northwestern points:

Whereas, the Director General of Railroads, in exercise of powers conferred upon the President by Section 10 of said Federal control act, increased the rates on coal from mines in Ohio and West Virginia via the lakes to points in the States of Minnesota, North Dakota, South Dakota and the northern portion of Wisconsin by 52c. per ton from such mines to the lakes and by various additional amounts from the western lake ports to the points of destination, while the rates on coal from mines in Illinois and Indiana to the same destination territory were increased 55c. per ton, and

Whereas, the Director General of Railroads has received numerous complaints, particularly from dock operators on the lakes alleging that the increases in the rates from Ohio and West Virginia mines disturbs the relationship theretofore existing with the Indiana and Illinois mines and that this change in rate relationship will seriously restrict the shipment of coal via the lakes, and under Section 8 of the Federal control act has requested the advice, assistance and coöperation of this Commission in the premises:

It is ordered, that the Commission enter upon an investigation into and concerning the relationship between the rates on coal to Minnesota, North Dakota, South Dakota and the northern portion of Wisconsin from mines in Ohio and West Virginia, via the lakes, and the rates on coal to the same destination territory from mines in Illinois and Indiana, all-rail, with a view to advising the Director General whether the relationship heretofore existing between the rates from the Indiana and Illinois mines and the rates from the Ohio and West Virginia mines should now be restored; and if so, in what manner the restoration should be accomplished.

It is further ordered, that this proceeding be, and it is hereby, assigned for hearing on June 25, 1919, ten o'clock a.m., at the office of the Interstate Commerce Commission, Washington, D. C., before Commissioner Clark.

Bureau of Mines Specialists Complete Investigation of Lignite

O. P. Hood, who has charge of the lignite investigations being made by the Bureau of Mines, has returned from an inspection trip through the North Dakota lignite fields greatly impressed with the immensity of the beds of brown lignite in that state. War conditions have stimulated the use of North Dakota lignite until it now is being used at the rate of 1,000,000 tons annually, Dr. Hood finds. He also is impressed with the fact that the average citizen in North Dakota is taking a serious interest in lignite and is willing to do all that lies in his power to make use of it for his every day personal needs.

The great problem which confronts the development of lignite in North Dakota is the finding of a market for the gas which is the principal byproduct of lignite preparation.

Dr. Hood and Bureau of Mines specialists now have completed their studies of the two great lignite fields of the country and soon will make a recommendation as to which is better suited for the establishment of the Government's experimental plant.

EDITORIALS

Mine Inspectors—Attention!

JULY 8 is to be the Grand Rally Day of the mine inspection forces of America. After an interim of three years, following their last gathering at Joplin, Mo., in 1916, the Mine Inspectors' Institute will hold its decennial meeting, this year, at Indianapolis, where the first conference of inspectors was held and the Institute organized, in 1908.

It had been expected to hold this decennial meeting at the regular time, July, 1917, but loyal to the country's call for increased output of coal, the executive board voted to postpone further meetings of the Institute to a time when inspectors could be better spared from their duties at the mines.

That time has now arrived and, although there is much labor unrest among mine workers, which demands the intelligent advice and coöperation of the inspectors in all mining districts, no better preparation for these duties is afforded than the coming together of the inspectors from all parts of this country and Canada to discuss such questions of mutual interest and benefit.

Let every mining department or bureau, every inspector and assistant inspector, in the United States and Canada bring this matter to the attention of their governors or other authorities at once and obtain their authorization for attending the Indianapolis meeting, July 8-11, 1919.

Each state and province should see that a good delegation of its inspectors attend the meetings and become members of the Institute. The expenses of inspectors in attendance should be met by their respective states or provinces, as the benefit derived from such gatherings is vast and important.

Attendance at the meetings is always open to all state, district or county mine inspectors, assistant inspectors and Federal commissioned officials engaged in the work of coal and metal mine inspection and investigation, in the United States and Canada. All are invited to become members of the Institute. The membership includes both coal and metal miners. Many ex-inspectors still retain their membership under special provision of the constitution.

Arrangements will always be made for the entertainment of the wives and lady friends of members in attendance at the meeting and it is hoped a large number of ladies will be present this year.

Let every inspector, then, get busy and *boost, boost* and *boost again,* for Indianapolis, in July. It is the old stamping ground where the Institute first saw the light. Rally to the high standard of efficiency in mine inspection.

South and Central America, while largely fuelless, produce bananas, coffee, mahogany, rubber, hides, platinum, nitrates and tin, materials for which we have much need. The coal trade, therefore, with South and Central America is as logical as is our trade with Canada. "See it grow!"

A "Mute and Inglorious" Profession

PERHAPS the engineering profession prides itself, in the words of Grey's "Elegy," on being mute and inglorious. Certainly our engineers are not good speakers. For the most part they do not impress the public in an interview, and they certainly do not distinguish themselves before an audience.

Muteness and ingloriousness quite generally go together. No wonder the lawyers pull down all the big jobs, the managerships, vice-presidencies and presidencies of our institutions. Those learned in the law can stand on their feet unabashed. They can argue their point of view, whereas the engineer—civil, mining, mechanical or electrical—surveys his shoes rather than the world in general and diligently digs into the depths of his pockets for stray coins the feel of which will ease the agony of his mind.

The engineers are looking up and looking over, and the lawyers who have talked expansively about nothing in general and about all things but the body of the fact in particular will have to give way. The big engineers' societies are now planning to give the professional man his proper place.

The years behind affect us more than we know. The engineering profession is one of the most recent of all. The recognized order of precedence has been the army, the church, the law, medicine and engineering. Fermentation in the politic mass is making changes in this long-established order, and the engineer is coming bubbling to the surface.

But all this change will not come about if reticence and silence, obsequiousness and indecision, are to be marks of the engineer in the conduct of his professional life. He has the knowledge which justifies confidence, and he should not leave to those who lack the wherewithal for management full possession of the field.

Some day our colleges will put out engineers who can write and who can speak, who can awaken in others the confidence that the possession of a collegiate education should inspire. The college will not only sharpen the nail but provide the hammer by which it can be driven home. *Coal Age* intends to give space to those who are trying in all engineering fields to put big engineers in the place where they rightly belong.

South America must not be rated by what it is but by what it will be. We must remember that in some respects it is like Seward's Alaska, a country of unknown and untold possibilities.

Further Steam-Shovel Possibilities

THE opportunity to mine coal with the steam shovel is not limited to the regions where the coal in general is under light cover. In the anthracite region the cover is heavy, yet here steam shoveling for coal first had its origin. The work is done only at the crops, and, as the seams are thick, the cover removed is often

of great depth. In fact the material to be transferred is so large in quantity that locomotives and dump cars have to be installed to remove it.

In the bituminous regions of Pennsylvania are miles and miles of coal crops, many exhibiting themselves in the poorest ground, which is often entirely untilled. As the coal enters the hill on a level it is possible to secure a large amount of mineral without much excavation. As nearby there is plenty of room for spoil, there need be no need for double shoveling. The shovel will drop the coal cover over the valueless wash crop and down the slope of the hill.

Many of the earlier mines left all the crop coal underground. The roof was bad. The coal was apt to be discolored, while nearby there was an abundance of bright hard coal with a good roof. For this reason the crop coal was left. But in many of these regions croppy coal is now being worked, and it would appear that much real Moshannon coal (Lower Freeport or "D" bed) for instance, could in that way be obtained. It would doubtless be a little rusty in places, but in all probability it would be somewhat lower in sulphur than the bed under heavier cover. There are many other sections, some of them mining coal just as good as the Moshannon and almost as badly depleted, where similar work might be done.

The benefits to be derived along the crop are not limited by the extent of the output uncovered by the shovel. In many cases pillars have been left in the workings as they approached the crop and these, being laid bare and being approachable owing to the work of the shovel, can be operated without much expense by underground methods. In fact it will probably be found that where there are revealed a hundred approaches to a mine through solid coal many old and imperfectly operated areas will be again made centers of activity.

It is much simpler to take out a pillar or pillars and thus enter an old mine than it is to clean up the falls in an abandoned heading. Given a free approach to a lot of pillars leading to the surface, there is always a chance of excavating a large area of coal. Without this means of approach one might not be able to profitably recover the coal lost in the mine.

In the anthracite region the old practice in stripping needs a new birth. The dinkey shovels, locomotives and dump cars need replacing with more modern and larger equipment. There are some signs that a change in viewpoint is coming and that excavations so large as to bring up recollections of the Panama Canal will cease to be conducted with such inadequate equipment as these old strip-pits exhibit.

Mules and horses are rapidly finding that their bad manners and low energy output are ousting them from the mines. But they seem to be holding on better on that part of the colliery work which is performed on the surface—why, it is hard to explain. The motor truck is as logical as the mine locomotive, but so far no one has come forward to present its case to the coal operator.

French Miners Strike for Short Hours

WHEN there is a shortage of coal, of provisions, of everything that makes home happy and endurable, the French workingman strikes for a shorter day. His British brother is no better; in fact he is worse, for he did it first and was even more peremptory.

The workingmen of Europe are tangling themselves in a net of their own weaving. They have had a long period of fighting. As far as the national well-being is concerned they would have done better if they had taken a four-year holiday. Perhaps even a ten-year vacation would be better than four years of war. The war was far more exacting than any work, and it was for causes infinitely more worthy than those which impel us to our daily labor; but these considerations are beside the mark, and it is fair to say that the evil effects of the war may be not inaptly compared to the outcome of a holiday of from four to ten years.

After such a vacation we would expect the nations of Europe to buckle to their task. "Here is devastation," we might anticipate them saying: "here are delayed purchases; here is lack of needed material; let us work diligently to obliterate the effects of the dislocation of effort." Instead the workingmen are going back with a resolution to do less than ever, and the bourgeoisie are disposed to lengthen their week ends till they meet in the middle of the week. What can become of such a mental attitude!

One would think that among the beneficent discoveries of the war must have been one for performing work without toil, and really, the government boasts would lead us to believe it was so. But we have no record of any such discovery. The world is little bettered by war inventions and apparently is on its way to be beggered by the war psychology and the dreams that the war had painted. The rich now bleat about shorter hours and better living for the workingman. It is well perhaps that thoughts like these replace that old feeling of the bourgeoisie that the workingman should never vulgarize the pleasures of the middle class by his participation in them. But all the goodwill toward the workman will never result in the amelioration of his lot unless both employer and employee are willing to do their uttermost to produce and again produce.

If the mine worker in France or Great Britain worked eight hours before the war, he should do so now. If there is to be any change, he should work even longer hours, till the need of the European allies for coal is fully satisfied. The great holiday of destruction, death and pain is over, and the time for laborious peace efforts has arrived. The European people will prove their mettle if they keep their "home fires burning" by steady toil.

In the United States there is more excuse for the shorter day, but we do not believe that seriously the workingman will want it when he realizes that it will be accompanied by small output and therefore by less remuneration. Our vacation of blood was shorter. It was only accompanied by waste and not by destruction. Our future and even our present is reasonably assured, but it will be a three-quarter future only if we are going to reduce our hours by one-quarter. If, on the other hand, we seek the "simple life" and resolve to cast off the excrescences of civilization, we can have our leisured ease; but if we would hold the prosperity that we have, let us arrange to spend as much time on its securing as we have in the past.

The American Federation of Labor, at its Atlantic City session, would have the teachers' opinions unhampered by boards of education. Then, with questionable consistency, it advocates that its own "unbiased" view of "industrial history" be taught in the schools.

THE LABOR SITUATION

EDITED BY R. DAWSON HALL

General Labor Review

No better evidence of the new alignment toward labor can be found than the report issued by the United States Chamber of Commerce in relation to its labor referendum. The report is dated June 22. The members of the Chamber of Commerce approved by a majority of more than two votes to one all the articles but No. 13, which was a proposal to establish a national employment system. The report chronicles the decision of the members that "the public interest requires adjustment of industrial relations by peaceful methods."

The members likewise recognize "the right of workers to organize," "that industrial harmony and prosperity will be most effectually promoted by adequate representation of the parties interested" and that "industrial-relations agreements should be faithfully observed."

The other declarations are that wages should be "reduced only when the possibility of reduction of costs in other directions has been exhausted," "that every man is entitled to an opportunity to earn a living wage" and that "wages shall be adjusted with due regard to their purchasing power." Fixing of a basic day as a "device for increasing compensation" is declared by the members to be a "subterfuge that should be condemned."

BRITISH BOARD WOULD HAVE NATION OWN MINES

No one, for a moment, expected that the majority report of the Royal Coal Commission in Great Britain, appointed under the Coal Industry Commission Act, would fail to recommend nationalization of that industry in Great Britain. There will be a natural tendency toward a similar attempt here, though it does not necessarily follow that nationalization will be imposed on the industry. The continent of Europe and Australia had previously owned railroads for years, yet Great Britain resisted, as also did we, that costly experience—in fact, both nations took counsel from the unfortunate foreign examples and determined not to follow them.

However, though Great Britain has resisted many tendencies toward national ownership, through its coal commission it now seems to be committed to mine nationalization. It is true there are four reports filed by the commission, representing as many points of view, but the most numerously signed report, dignified with the signature of the chairman, Justice Sir John Sankey (a former judge on the Kings Bench and prior to that a barrister who had a large practice in mining cases) is whole heartedly for the taking over of the industry by the nation. That report recommends immediate legislation for the acquisition of the mines, royalties for the state and compensation for mine owners. The provisions of the report call for the administration of the collieries during a period of three years by local, district and national mining councils. At the close of that time legislation will have been framed for the acquiring of the mines and the owners will have been justly compensated.

MINERS OBJECT TO COMPENSATION OF LAND OWNERS

The miners' representatives in general agree that the report signed by Justice Sankey is satisfactory, but they object to a clause that would require the mine workers to sign a contract to cease work until any question that may be in dispute has been before the appropriate councils. The three representatives of the miners, Robert Smillie, president of the Miners' Federation of Great Britain; Frank Hodges, secretary of the same organization, and Herbert Smith, president of the Yorkshire Miners Union and vice president of the larger federation, declare in their report that no compensation should be given, apart from certain allowances made where small royalty owners are deprived of their livelihood.

The mine owners in their report argue that any form of nationalization would be detrimental to the development of the industry and the economical life of the country. The document declares that no action which so vitally affects the business of the whole nation should be taken without referring the question to the whole community. The report favors, however, the formation of a department of mines to be assisted by a system of councils such as the majority report sets forth. In order that the difficulties arising from royalties may be met, the operators' report proposes that the state acquire ownership of the coal subject to the continuance of existing leases for at least 60 years.

Sir Arthur Duckham, the Director General of Aircraft Production, makes the fourth report, recommending state acquisition of the entire mineral rights and the establishment of a Ministry of Mines with representation of labor on the directorate.

MINE WORKERS URGE A REASONABLE CONTRACT

On June 15 a secret session of past and present chiefs of the United Mine Workers of America was held at Atlantic City, N. J., at which were present John Mitchell and John P. White, former presidents of the organization; William J. Ryan, former international secretary-treasurer, now representing the National Fuel Administration at Kansas City, Mo.; J. L. Lewis, vice president of the United Mine Workers; John Moore, president of the Ohio district; Philip Murray, president of the Pittsburgh district; William Green, national secretary of the United Mine Workers, and a number of others. Little was learned of the business transacted. John L. Lewis said, according to newspaper reports, that "an orderly, sensible policy applied in a practical manner is what we have decided upon."

"I am not in favor of anything at this time that would disrupt reconstruction of industrial matters," said John Mitchell after the conference. "But the employers must remember at this stage of the situation that labor has some rights that should not be forgotten, but be recognized more than in the past."

On June 23, the American Federation of Labor, which met at Atlantic City, declared itself in favor of a universal 44-hour week in industry and pledged support to unions that were planning for a 6-hour day. It also called for double time as a penalizing measure.

GREEN STILL ADVOCATES THE SHORTER DAY

Delegate William Green of the United Mine Workers said that the organization he represented intended to press for a workday of less than 8 hours in order to keep all the unemployed in the industry busy. He said that, with an 8-hour day and 100,000 men less than the industry had under the longer day, the coal mines had produced the greatest output in the history of the industry.

It may be said in this connection, in opposition to what Mr. Green has stated, that the shortage of coal now assures work to every one, and the shorter day should go over to a later time, if it is ever to be put in operation. The shorter day will never guarantee steady work unless there is a restriction in the number of new mines or additional workers. The agreement for a shorter day will be a signal for a large expansion in the industry such as will make it necessary either to work irregularly or to work still shorter hours. If the shorter day is introduced and the public runs short of coal it will know where to place the blame.

In the anthracite region a few troubles have recently occurred. The Hudson Coal Co. disaster stirred up the men, and, for a short while, there was a feeling that the company would try to find a means by which it might avoid

the payment of compensation losses. However, the minds of the men were soon disabused, for the chief counsel of the coal company, H. J. Torrey, of Scranton, lost no time in declaring to H. A. Mackey, of Philadelphia, chairman of the Workmen's Compensation Board, that the casualties were compensable. As fast as each case came up, the company disposed of it in a liberal spirit, as the statement by Mr. Mackey on June 14 clearly shows:

"Reports received from officials assigned to Wilkes-Barre to arrange for immediate compensation for the surviving injured workmen and the families of the deceased victims of the mine disaster in the Baltimore tunnel shows that with a few minor exceptions every claim has been settled within the last week. There were 92 deaths in the catastrophe, and 43 men were injured. The survivors of those killed include 40 widows, 106 children and 10 dependent parents. The agreements for compensation will average $4028.65 per claimant. The cases not settled include a dozen in which the dependents are residents of countries which are at war with the United States. These claims will be placed for the present with the federal custodian of alien property. The immediate settlement of claims, under the provision of the compensation act, has been due chiefly to the broad spirt of the Hudson Coal Co. and the remarkable efficiency of its compensation department. The company did not quibble, but leaned to the other extreme in its efforts to rush compensation along.

"The company established offices upon its own ground for the use of board officials while they were arranging the compensation agreements and even utilized automobiles to bring the dependents to these headquarters. In less than a week's time the entire problem of securing compensation for the victims has been solved, and another valuable demonstration has been made of the prompt action secured under the compensation act as contrasted with the delays and losses that occurred under the old laws."

However, the agitation did not end when full compensation was made. At the mines of the Hudson Coal Co. there has been, for some time, a claim for back pay aggregating $50,000. It has relation to the presence of slate in the coal which slate has to be removed. The miners have claimed consideration for this impurity under the scale as officially interpreted by the conciliation board. The men threatened not to go to work on Monday, June 23, if the questions at issue were not settled satisfactorily by Sunday. Claims for about $14,000 remained unsettled on that day, and the miners agreed to give further time for their consideration.

If the plan of the mine workers had been carried out 28 collieries would have been closed down between Forest City and Plymouth, and 11,000 men would have been laid idle. The difficulties appear to have reference solely to the conditions in the Clinton and Crystal Collieries. The settlement is a matter for congratulation, as the Hudson Coal Co. has shown itself, at least in recent years, quite anxious to advance the interests of its employees and its steady goodwill should by this time have begun to show results. Unfortunately it has, in places, a number of men who are never happy unless they can find excuse for trouble.

Another anthracite strike is that at the mines of the West End Coal Co., where on June 12 1500 mine workers were idle trying to settle by a strike what their agreement declares must go to the conciliation board. The agreement fails of its purpose if it does not end strikes.

Speaking at Wilkes-Barre, at a meeting in memory of the men who died in the Baltimore tunnel disaster, William Green, the secretary-treasurer of the United Mine Workers, denied that the mine workers would strike in sympathy with Thomas Mooney, though they greatly desire to see him freed. The plan of the Industrial Workers of the World was for all workers to strike five days at the beginning of each month, the abstention from work to continue till Thomas Mooney was liberated. The first strike was to commence July 1.

Mr. Green advocated in his speech to the mine workers that 66⅔ per cent. should be the amount of compensation provided and that no worker should be required to wait two weeks before drawing compensation for injuries received at his work.

In western Pennsylvania two strikes have been settled. It will be remembered that there was a suspension at the McFetridge Coal Co.'s mine, at Creighton, involving about 200 men. They quit on June 2 owing to a disagreement with the company. The mine, which has run nonunion for more than 20 years, is now to be a union mine, arrangements having been made to incorporate it into District No. 5, in which it naturally belongs, being in Allegheny County. It was announced June 12 at the headquarters of the United Mine Workers in Pittsburgh that the Bessemer field in which the McFetridge Coal Co. operates is now entirely unionized with the exception of one concern and even there negotiations are pending.

A report under date of June 11 states that Vesta No. 5 of the Jones and Laughlin company, located at Fredricktown, has returned to work after a strike of 8 weeks regarding the allocation of a house to a man who had left the service of the company and moved temporarily elsewhere. The strike caused a movement in sympathy at Vesta No. 4, located at California, Penn., and strange to say this mine was still striking after Vesta No. 5 had composed its troubles.

In West Virginia there are no strikes in the coal mines, as far as the news reveals, but there has been a strike of the employees of the motive-power department of the Norfolk & Western Ry. about the discharge of six men at Wilcoe. This has prevented the operation of many mines.

However, at the call of the first shift on Monday morning, June 16, after a strike of over one week, the striking employees returned to work in consequence of an agreement made between representatives of the American Federation of Labor and officials of the Norfolk and Western Ry. During the life of the strike, which began June 4, time freight was moved only after the greatest delay. The movement of west-bound freight was much curtailed and east-bound business was almost at a standstill. In the block mines of Indiana there has been a strike. Two hundred coal miners employed at the Franklin-Tandy-Low mine, west of Brazil, struck June 16 when the company ceased giving a bonus of 6c. a ton. The miners, who have been receiving 90c. a ton, say the extra 6c. was paid for leaving a strip of coal on the roof of the mine to support the roof and keep it from falling. The company, in rebuttal, says that the extra money was a war bonus. The matter has been taken up by officials of District No. 11.

JOHN MOORE, president of the Ohio miners, delivered himself as follows in a recent statement to the press: "In eastern Ohio, practically adjacent to the Pittsburgh district, a few months ago there was idleness in Belmont, Jefferson, Guernsey, Tuscarawas and Monroe counties. Our men were getting impatient and I might say to the revolutionary stage. Today they are all working and the coal operators are clamoring for more men. From the records kept in our office about 14 per cent of the foreign-born miners in southern Ohio have asked passports to go home with the little wad they have made during war times when things were flush. This means a decrease in man-power. It means also a shortage of the supply of coal during the fall and winter months. This is no time to throw a monkey-wrench into the industrial machinery of the country which is being gradually greased. Let everybody get on the job to have things going good and proper."

Don't Carry Powder on a Man Trip

ON June 5 an explosion in the Baltimore Tunnel, at Wilkes-Barre, Penn., resulted in the death of 92 men, the widowhood of 43 wives, the making of 106 orphans, and the bereavement of 10 dependent parents. Among those who paid the price for negligence and carelessness was the father of the family shown in the photograph. The more we study the picture, the more we realize that the living are more in need of our tears than the dead.

THE father of this family may not have been a careless man—the look of his family suggests that he was a more than usually good citizen—but because there were careless men with him, and because there were men who did not observe the union rules and agreements as to carrying powder with them on the man trip, he died a terrible death, leaving a widow and seven children.

What Precautions Are You Taking to Protect Yourself and Family and the Families of Those Who Ride the Cars With You?

DISCUSSION BY READERS

EDITED BY JAMES T. BEARD

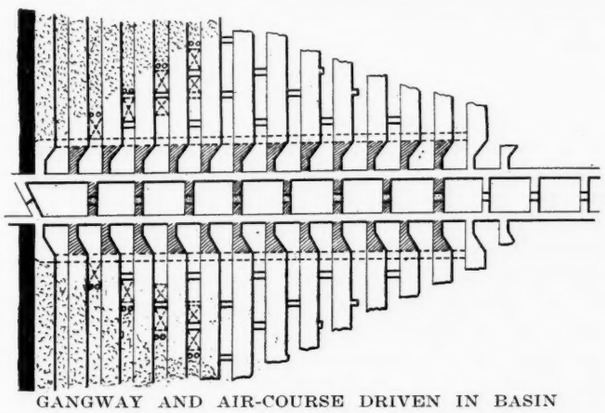
Drawing Pillars on Steep Pitches

Letter No. 1—I have been much interested in reading the inquiry signed "Luzerne," *Coal Age*, May 15, p. 924, because I had a similar experience some time since in taking out the coal in the "Pittston" or "Cooper vein," in this county. If I mistake not, the inquirer whose case is here presented, is operating in the same vein and, if so, the suggestions I have to offer may be of some assistance to him.

First, then, let me say that my friend's trouble may arise from too small a thickness of pillar left between the gangway and the airway, both being driven in the basin, from which the coal pitches on each side from 35 to 45 deg. My experience is that, as a rule, no squeeze will start in the chambers owing to the coal lying on this pitch.

In my case, it was necessary to temporarily abandon the airway in the basin and to start a counter, about 40 ft. above the airway on the pitch. This counter was driven parallel to the airway and, as it crossed each chamber, the mouth of the chamber below was filled solid with rock, from the airway up to the counter.

In the accompanying sketch are shown the gangway and airway driven in the basin and the chambers



GANGWAY AND AIR-COURSE DRIVEN IN BASIN

driven to the pitch on each side of these entries. The counter is indicated by the dotted line and the rock filling the mouth of each chamber is shown by the hatched portion between the counter and the airway. Moreover, as shown in the sketch, each crosscut between the gangway and airway was filled solid with rock, in the same manner as the chambers.

The coal was 14 ft. thick and overlaid with a solid sandrock roof. In each chamber, a line of props was set 8 ft. from the rib, the timbers being 20 ft. apart. Old wooden rails were then spiked to the bottom of each prop. Also, two or three props were stood just behind the pillar being drawn, and old rails or lagging were nailed to the back of these to protect the workmen against loose material falling down the pitch.

This arrangement had the effect to protect the slide or chute at the side of each pillar. When a cave occurred, the loose material was deflected so that it did not obstruct the chute and interfere with the loading of the coal, which ran down to the battery erected near the mouth of each chamber.

In the drawing of the pillars, narrow cross-headings were driven through each pillar at distances of 14 ft. apart, thereby dividing the pillar into separate stumps, which were blown out in one operation by drilling several holes to the center of the stump and charging and firing these holes by an electric battery.

As each two pillars on opposite sides of the main roads were finished, the chamber stump and gangway pillars were taken out. By that time, the rock filling previously mentioned had become so solid that the roof did not cave when taking out these pillars. To this day, one is able to walk through these places where the pillars used to be. It is, of course, not 14 ft. in height, but the headroom is sufficient to take an empty car along the road.

RICHARD BOWEN.

West Pittston, Penn.

Safety in Mine Timbering

Letter No. 2—While there are many good points brought out in the letter of Jesse Hamilton, *Coal Age*, May 15, p. 919, and in the previous article to which he has referred, written by Joseph R. Thomas, Feb. 20, p. 349, I feed that they have failed to mention a method of supporting the roof on haulage roads that, to my notion, is far superior than any form of timbering that can be adopted.

It surprises me that Mr. Hamilton, who formerly had a great deal to do with this method, which was then in use on the main haulage road in a certain mine here and which has since proved to be the best and most practicable means that I have ever seen adopted for that purpose, should have omitted to refer to the method in his letter.

USE OF IRON RAILS TO SUPPORT ROOF

In that mine, it was the practice to use the discarded rails as roof supports set 4 ft. apart and hitched into the rib on either side of the haulage road. The work was well done and certainly looked practical. The use of rails, instead of timber crossbars gave a good, clear headroom on the road.

In speaking of the number of accidents due to falls of roof, it is noticeable that there are far more of such accidents occurring at the working face than on the roadways in the mine. This may be due to several causes. For instance, the men remain a much longer time in their working places than they spend in traveling the roads. Also, a bad piece of top on the road is observed by the many men passing in and out of the mine, while a bad roof in a working place is seen only by the few men who go into that place. But safety on the haulage roads is as important as at the working face.

In the use of iron rails in the manner I have mentioned, the risk of timbers being knocked out by cars

jumping the track is avoided, and this alone is a strong argument in favor of such a method of supporting the roof over a roadway. I have seen accidents happen when a car knocked out a few temporary timbers set for the support of a bad piece of top. In one instance, the timbers were set by the instructions of the foreman, who was responsible for the results that followed.

In mine timbering, "Safety First" should be the watchword. Any person, whatever his position, should report any dangers that he may observe, and the foreman, or one of his assistants, should take prompt measures to remove the danger. Owing to the larger number of accidents occurring at the working face, more attention should be paid to visiting and inspecting the places where the men are at work, than in patroling the haulage roads and travelingways in a mine.

Duty of Miners to Insure Their Own Safety

Every miner's first duty, on entering his place in the morning and before proceeding to work, is to examine his roof carefully and reset any timbers that may have been discharged by a blast the night before. The safety of each miner depends on his taking this precaution. At a mine I visited not long ago, I saw a good sign on the headframe that read as follows: "Sound your roof. Set your posts. Load your coal. Safety first."

Safety in the rooms requires the prompt delivery of timber at the working face. When a miner finds that his timber has not been delivered, as ordered, it is well for him to stay out of his place until he can get the timber he needs. The loss of a dollar or so is as nothing compared with the danger of being hurt or killed by falling roof. I believe in systematic timbering, and a good rule to adopt at the working face is to set all timbers not more than 4 ft. apart or closer, if necessary. Even then, the safety of each miner depends on his keeping a careful watch of the roof in his place throughout the day.

It is well for a miner to remember that no good superintendent or foreman will excuse the driver who neglects to deliver timber promptly where it is needed in the mine. Most coal-producing states have certain provisions, in their mining laws, regulating the supply and the setting of timbers in mines, and these laws should be strictly obeyed. INSPECTOR.

———, Ind.

Longwall Work in Low Seams

Letter No. 2—In reference to the modified longwall system proposed by Charles Martin, *Coal Age*, Mar. 20, p. 520, I beg to submit the following outline bearing on the probable success of the method he has suggested:

In applying the longwall system to work a low seam of coal varying, say from 20 to 24 in., it is practically impossible to mine such coal at a profit, unless it is first undercut by a small longwall machine and loaded out either by means of a scoop or by the Thompson conveyor mentioned by Mr. Bain in his letter, *Coal Age* May 22, p. 965. I am not familiar with that conveyor but, from Mr. Bain's description, I should think that it would work satisfactorily, although it seems to me that the coal would have to be shoveled into the pans and then, of course, transported by means of rope haulage to the car on the main haulage road.

The scoop system, however, appears to be a great improvement on the Thompson conveyor, in that practically no shoveling need be done. It is astonishing how little coal this scoop will push to one side when it is drawn up from the haulage road to the end of the cut. In coming down again, the scoop fills itself and carries the coal to the chute where it is dumped directly into the car. It is also surprising to note with what ease this scoop will operate on a fairly uneven bottom; but, of course, the smoother the bottom the better the operation. The scoop is operated by a main and tail rope winding on a double drum, which is operated either by an electric or an air hoist. A complete description of this operation has been given in a recent issue of *Coal Age*.

In sections where there is locomotive transportation, direct current is available for the operation of the scoop hoist and also for the longwall undercutter. However, a longwall undercutter operated by an alternating-current motor has been perfected and gives excellent results, so that where direct current is not available, the hoist and undercutter can be operated by alternating current.

It is possible, of course, to drill the coal face by means of jackhammers and blow the coal off the solid, but this produces a lot of fine coal and makes an uneven face that cannot well be cleaned up by the scoop. In this system of longwall mining it is best to keep the face straight and at right angles to the main haulage road.

Length and Arrangement of a Longwall Face

I do not regard with favor Mr. Martin's oblique face, as it seems to me that it would cause difficulty in the operation of the mining machines. However, not having seen the operation of this oblique longwall face, I would not care to say that it does not have the advantages claimed.

It is my experience that a face of 300 ft., in bituminous mining, and 200 to 250 ft., in anthracite mining, is the best economic limit. To control a fracture it is necessary to have a man on the job who thoroughly understands the longwall system and will timber systematically, and make his rockpacks correctly.

Where the scraper system is used (and this applies as well to the Thompson conveyor) there is no trouble in moving the mining machine anywhere along the face, as the ropes can be detached from the scoop and attached to the machine, which is then moved by means of the hoist. In this way, it is possible to operate a longwall system on the fairly heavy pitches found in some of the anthracite mines.

There are many conditions that affect the operation of longwall work and which are not mentioned in Mr. Martin's article. For example, he does not say whether the section is dry or wet, or state the thickness of cover, presence of gas, character of the coal, kind of roof immediately overlying the coal and the presence of dirt or rock seams in the coal. Some of these would absolutely prohibit longwall work in this thin seam.

In answer to Mr. Martin, I can only make the general notes given above, but will say that where the coal is thin and conditions are favorable for any type of longwall mining, the combination of undercutting and scoop loading will produce coal as cheaply as any other method that I know.

In very many of the thin seams of the anthracite field, there is about a foot of rock above the coal and that comes down or is easily broken down after the coal is taken out. This makes an extremely favorable condi-

tion for building rockpacks. Moreover, the rock has a cubic fracture, which makes the building of uniform packs very easy.

All timber and cogs should be drawn so that the roof will come down and exert a uniform pressure on the coal face. Where the loading is done by scoop the cutting should, of course, be done on the nightshift, so that there will be no delay on the day shift when the coal is loaded out. It is unnecessary to add that the work should progress uniformly, as the success of all longwall work depends on this one fact.

Scranton, Penn. SUPERINTENDENT.

Available Oxygen

Letter No. 1—Reading the interesting reply to the question of a student who asked for the reason why a safety lamp will burn in the air but is extinguished in carbon dioxide, *Coal Age*, May 8, p. 880, tempts me to offer a few comments on the nature of blackdamp, which has been so fully investigated by the eminent chemist, Dr. J. S. Haldane, as well as by our own chemists of the Federal Bureau of Mines. In Miner's Circular No. 14, p. 13, it is stated that "average blackdamp contains 10 to 15 per cent. carbon dioxide and 85 to 90 per cent. nitrogen; the proportion of carbon dioxide is seldom more than 20 per cent. or less than 5 per cent."

The analyses made of mine air, of which the Bureau of Mines have made a large number, reveal the truth of the fact as claimed by Doctor Haldane that the dimming and final extinction of the lamp in blackdamp, in the mine, is chiefly the result of the depletion of the oxygen of the mine air, or in other words, the lack of available oxygen in the blackdamp, rather than to the presence of carbon dioxide. As stated in the reply to the inquiry on page 880, the burning of the lamp depends on the amount of available oxygen present, and where this is insufficient to support the combustion of the carbonaceous matter, the flame is extinguished.

Toxic Effect of Carbon Dioxide

While the experiments of the Bureau of Mines have established the fact quite conclusively that the extinction of the lamp in a mine atmosphere is not ordinarily due to the presence of carbon dioxide in the air but rather to the lack of oxygen necessary to support the combustion of the lamp, it is nevertheless believed that the presence of the carbon dioxide in such an atmosphere is the probable cause of the discomfort and distress felt by men compelled to breathe the air.

The experiments of Professor Clowes, in England, as well as those of the Federal Bureau of Mines, have shown that a mine atmosphere in which the oxygen has been depleted to about 17 per cent., by the addition of carbon dioxide generated in the mine, extinguishes the flame of a lamp burning sperm, cottonseed or lard oil *(Mine Gases and Explosions—Beard, p. 140)*.

The gradual depletion of the oxygen of pure air from 20.9 per cent. is accompanied with an increasing dimness of the lamp, until its final extinction at about 17 per cent. The acetylene or carbide lamp, however, continues to burn, according to the statement of the Bureau of Mines, until the depletion of the oxygen has reached 13 or 12 per cent. It is for this reason that objection has been made, at different times, to the use of the carbide lamp, which thus continues to burn in an atmosphere fatal to life. However, it seems to me that the labored breathing of a man in an atmosphere that is increasingly dangerous should be sufficient warning for him to withdraw to better air.

Again quoting from Miner's Circular No. 14, pp. 14, 15, in reference to the effect of breathing mine air low in oxygen, the following statement appears:

"Many authors have stated that mine air containing less oxygen and more carbon dioxide than ordinary outside air is in itself without effect on man. As regards oxygen, this is proved by the fact that in one pound of the air at a place 5000 ft. above sea level, like Denver, there is the same weight of oxygen as in one pound of air at sea level containing by volume 17.5 per cent. oxygen.[1]" This is followed by a quotation from Haldane that appeared to support the contention of such authors; but the Bureau of Mines draws attention to the fact that the statement of Doctor Haldane refers only to fresh air and has no reference to air containing carbon dioxide.

I thought these references would be of interest in connection with the question of available oxygen in the atmosphere. CHEMIST.

Scranton, Penn.

Certification and Safety

Letter No. 7—The question of the certification of mine officials, in its relation to the safety of mines and the men employed therein, I consider a very important and vital one not only to mine workers but to the coal operators who employ them and to mining men in general.

The matter of certification, indeed, involves not only the safety of the mine but the economy of its operation. In a brief manner, allow me to outline different types of men who, as candidates for mine foremanship, possess quite different degrees of ability in respect to safety and efficiency in the operation of a mine.

First, there is the man who is versed in mathematics, geology, ventilation, etc.; in other words, he has a good knowledge of the theory of mining. I will assume, however, this man has little practical experience that would enable him to produce a good tonnage of coal at a moderate cost of operation. His ability to handle men in a productive capacity is naturally quite limited; and, owing to his lack of mining experience, he is unable to put into practice his knowledge of the theory of ventilation, hauling, timbering, pumping and draining, methods of working and other things that the successful mine foreman must understand in a practical way.

Every cause has its effect and the capabilities of a mine foreman are the causes that must produce their effects on the daily production of a mine and the monthly cost-sheet, on which most largely depends the dividends that the owner of the mine or the stockholders have a right to expect.

Second, there is the practical mining man who has had a long experience in producing coal and handling men. Here, again, I will assume that this man lacks the knowledge of the theory of mining, which is his great

[1]This statement is wrong. The meaning intended to be conveyed is that, volume for volume, pure fresh air at Denver, containing 20.9 per cent. oxygen, holds the same weight of oxygen as air at sea level, in which the oxygen has been depleted to 17.5 per cent. In other words, breathing into the lungs the same volume of Denver fresh air (20.9% O.) and air at sea level lower in oxygen (17.5% O.) supplies to the lungs the same weight of oxygen each breath taken. However, breathing the rarefied air of Denver results in more rapid but not as deep inhalations as at sea level.

setback and the one cause that produces a most notable effect both on the regular daily production of the mine and the monthly cost-sheet. It is frequently necessary for this man to explain to the management why a day's tonnage has fallen short of the average, or why the cost-sheet for any month is unusually large.

Typewritten reports coming from the office inform our practical friend of the high cost of production; but these are matters that he cannot follow out in detail. The reports show that there are leaks somewhere but do not tell him where to find them, and he is at a loss to figure it out for himself. The superintendent to whom he goes in his dilemma is helpless to assist him, owing to a lack of practical experience. The results obtained by this foreman can be readily imagined.

Third, there is a candidate for foremanship who has both the technical knowledge and the practical experience required to make a successful man to place in charge of a mine. This man's failure, however, consists in his temperament. He is quick and impulsive and makes many mistakes on that account. For the same reason, he does not succeed well in the handling of his men. These are some of the causes that have their effect in lowering the tonnage and increasing the cost of production of coal.

Type of Foreman Mine Operators Desire

Fourth and finally, there is the really successful candidate for the position of mine foreman who possesses not only a full knowledge of the theory of mining, backed by a long practical experience in the operation of mines and the handling of men, but he has an even temper, good judgment and a manner that invites cooperation and gains the confidence of his men. They learn to trust him for a fair deal. He is a good judge of human nature and his knowledge of work enables him to tell what each man can do to the best advantage. The result of these characteristics in a foreman are far-reaching in securing a good daily tonnage and reducing the cost of production in the mine. He is the type of man that operators, generally, are seeking today.

Now, having before me these several types of men applying for mine foremanship, it is my conviction that coal mining is made safer and a higher efficiency will be attained by requiring the examination and certification of all candidates for the position of mine foreman, assistant foreman and fireboss. Indeed I would not stop here, but would advocate the examination of candidates for the position of mine superintendent and would suggest that a higher percentage of efficiency should be required for that position than for any of the others previously mentioned. Considering the matter from its face value, there appears to be no reason why a candidate for the superintendency of a mine should not be required to pass an examination that would determine his competency to hold that position.

A mine superintendent should naturally possess a full knowledge of all mining work, to enable him to counsel, advise and instruct the under-officials in his charge. Every year the work of coal mining is developing a greater need of technical knowledge in all mine officials, in order to produce a larger tonnage at a reduced cost of operation. We are, as it were, in a reconstructive era following the war. Let us look at our industrial problem from that viewpoint.

Allow me to say in closing that examining boards should be comprised of men of integrity and ability, who are fully acquainted with the theory and practice of coal mining and able, themselves, to answer the questions they submit to candidates. Not only that, but examiners must be able to judge, in a competent way, the answers submitted by men taking the examination.

John E. Ambrose.

Fairmont, W. Va.

Firebosses as State Officials

Letter No. 5—After reading the several letters written on this subject, I feel with Edward H. Coxe, that the employment of firebosses by the state would not work well. In his letter, *Coal Age*, May 8, p. 876, Mr. Coxe expresses the idea that state mine inspectors are employed to see that the mines are kept in a safe and healthy condition, and I would add that the mine foreman and his assistants are charged with the duties of looking after the safety and welfare of all the men employed underground.

The mining law of Pennsylvania and those of other states specify the duties of the foreman and his assistants, as well as those of the fireboss, who must examine the mine and report any dangers that he may find. It is my idea that the work of the fireboss is such that he should be subject to the mine foreman, who is in direct charge of the mines and responsible for its safe condition. These officials should work in harmony. If there is any reason why the fireboss should be employed by the state, there is all the more reason that the state should also employ the mine foreman and his assistants.

It has been suggested that state mine inspectors have too much to look after to make the necessary frequent visits to a mine to insure its safety. If that is the case, let me say that the state should employ more inspectors and give to each inspector a smaller district, or else deputy mine inspectors should be appointed to assist the district inspectors.

Disadvantage of Employing State Firebosses

In my opinion, the fireboss is the most useful person employed in a mine. His work is of such a nature that he is fully acquainted with every place in his district and knows each man that works there. For that reason, he can always supply much needed information to the foreman and, in many other ways, help to make a good day's run. How different would this be if firebosses were employed by the state?

Suppose, for instance, that a state fireboss, on duty in a remote section of a mine, finds that a wreck has just occurred on the haulage road and no coal can be hauled from that section until the track is cleared. Now, if this fireboss was employed by the company he would naturally feel an interest in the work of clearing away the wreck and getting out the coal. The foreman being away in another portion of the mine, he would throw off his coat and assist to clear the track. But on the other hand, a state-employed fireboss would naturally feel that the wreck was none of his affair and lend no assistance to get things again in shape. In other words, he would "pass by on the other side," with a lofty and disinterested air.

Other instances could be mentioned in which a fireboss employed by the state would prove a hindrance to the work of getting out the coal, instead of a help. Neither would the safety of the mine be made any more certain by state employment than where a con-

scientious fireboss is employed by the company operating the mine.

If it is true, as has been stated, that a mine foreman is disposed to underestimate the work of the fireboss and, as we say attempt to "put something over on him," the matter should be reported promptly to the superintendent, who ought to be broad-minded enough to straighten out the difficulty promptly, and do justice to a fireboss who performs his duties faithfully.

Where a fireboss receives just treatment, I do not think he would desire to be employed by the state. Moreover, every mine foreman should have qualified for his position, by serving a certain length of time as a fireboss and such a foreman will not generally be disposed to ill treat his firebosses, realizing as he will from his own experience the difficulties of that position.

McIntyre, Penn. THOMAS HOGARTH.

Letter No. 6—I want to endorse what Edward H. Coxe has said in his letter, *Coal Age*, May 8, p. 876. In his argument against the employment of firebosses by the state, it seems to me that Mr. Coxe has covered the ground so completely that there is little room for further comment on that side of the question. However, a few thoughts have come to me that I wish to present.

In the first place, whenever a mine is generating firedamp it is of the utmost importance to employ a thoroughly competent and reliable fireboss whose judgment in regard to conditions that are safe or unsafe will always be respected by both the mine officials and the men who work in the mine. Such a man will perform his duty equally well regardless of whether he is is employed by a company or the state.

DANGEROUS SITUATION CAUSED BY AN INCOMPETENT FIREBOSS EMPLOYED BY THE STATE

When a fireboss employed by the state proves to be incompetent or negligent in the performance of his duties, and the lives of men working in the mine are endangered by reason of that fact, neither the superintendent nor the foreman would have any authority to remove him from the mine. An application for the removal of a state fireboss would have to be made to the state appointing power, and that would require time. Before any action could be secured or relief obtained, a serious accident might result from that official's incompetence or negligence and the state would be responsible for the consequences.

Again, although this should not be, it must be admitted that there is always more or less of politics influencing state appointments, and I take it that the state employment of firebosses would not be immune in this respect. Nine times out of ten, the applicant with the "strongest pull" would secure the appointment, regardless of his relative competency and efficiency. No one will deny that this would seriously lower the standard of firebosses in our mines.

In discussing the efficiency of firebosses, a short time ago, Fred Turner stated that he knew of "firebosses who would do anything they are told, without regard to whether their acts are lawful or dangerous to the men working in the mine." In my opinion, such a fireboss would prove no safer in the employment of the state than if employed by a company, and his certificate should be revoked at once and the man sent back to the pick. Mention has been made of the awkwardness of a fireboss who is compelled to work under an inefficient foreman; but it appears to me that it would be a far more awkward situation for a company to be compelled to operate its mines under dangerous conditions, with an inefficient fireboss employed by the state and over whom they have no control.

In this state the mining law declares that the mine foreman and the gasboss, in the discharge of their duties, act as the representatives or agents of the operators or owners of the mine in which they are employed. The duties and responsibilities of both of these officials are the same as far as the safety of the employees is concerned. Although employed by the company, both of these officials act under the state law and are held responsible by it for negligence on their part. Now, it appears to me that if firebosses are to be made more efficient in the employment of the state, the same rule would apply to mine foremen and superintendents. It is my belief, however, that no greater efficiency will be secured and our mines would not be made safer by the state employment of mine officials; but there would result, instead, much confusion and delay in the important work of firebossing. JOHN ROSE.

Dayton, Tenn. Former District Mine Inspector.

Exhaust from Steam Pump

Letter No. 10—Referring to the letter of R. J. Pickett, *Coal Age*, May 22, p. 964, and the editorial note that follows the letter, I would like to ask the reason for assuming that Mr. Pickett's plan has for "its chief object the cooling of the water in the sump." The scheme is not clear to me although a sketch showing the exact arrangement would have made it a little easier to understand.

Mr. Pickett clearly states that exhausting the steam into the sump made the water very hot. What I fail to understand is that if it was possible to pump the hot water out of the sump, why should he attempt to devise a plan for cooling the water in the sump?

Now, according to the best information I have, a pump will not lift hot water, because of the vapor formed in the suction pipe destroying the vacuum required to raise the water to the pump. In the present case, the sump is said to be just below the pump and the lift was not therefore great.

It occurs to me that if this pump could be placed below the level of the water in the sump, so that the water would gravitate to the pump, such an arrangement would overcome the difficulty of handling the hot water and avoid the necessity of providing a means to cool the water in the sump. GEORGE J. KEARNEY.

Kincaid, Ill.

[It is true that a pump will not work with the same efficiency when the water in the sump becomes heated by the exhaust steam turned into the sump. However, this correspondent misjudges the case by suggesting that it is possible to continue pumping the water, which is growing hotter all the time. The plan devised by Mr. Pickett has for its purpose the cooling of the sump water, from time to time, by allowing water from the main to flow back into the sump. By this means, the temperature of the sump water is kept low enough not to seriously interfere with the pumping, the suction lift being very small.

This letter will close the discussion of "Exhaust from Steam Pump."—EDITOR.]

INQUIRIES OF GENERAL INTEREST

ANSWERED BY JAMES T. BEARD

World's Production Record

In the issue of *Coal Age*, May 1, p. 799, there appeared an article showing the effect of equipping a mine with self-dumping cages to increase its capacity, and mention is there made of a record hoist. This has since been referred to as a .'world record" by a correspondent, June 5, p. 1053.

In the first article, it is stated that the Orient mine, of the Chicago, Wilmington & Franklin Co., Mar. 6, 1919, hoisted 6777 tons of coal from a depth of 600 ft., which I agree must be a new world's record for a shaft mine hoisting one car of coal at a time.

It would be interesting to know two items regarding this hoist that are not mentioned in the article; namely, the number of hoists that were required to produce this tonnage and the number of hours in which the work of hoisting was performed. If *Coal Age* can supply this information, it will prove interesting to very many of its readers. G. E. HUTTLE.

Scottdale, Penn.

In response to our letter of inquiry, T. F. Holmes, general superintendent of the Chicago, Wilmington & Franklin Coal Co., at Orient, Ill., writes as follows:

"Regarding the record hoist made at the Orient mine in Franklin County and in compliance with your request, I am pleased to give you the desired data as taken from our reports: The Orient mine is 520 ft. deep. To this depth must be added 80 ft., the height of the dump circles above the surface of the ground at the lower landing, which makes the total height of hoist 600 ft.

"On Mar. 5, 1919, this mine produced 6422 tons of coal, making 1401 dumps in an 8-hour shift, notwithstanding there was a loss of 25 min. in the last hour, owing to valve-stem trouble on the hoisting engine. This accident prevented a record run being made on that day.

"On the following day, Mar. 6, the mine produced 6776.75 tons of coal, making 1502 dumps in an 8-hour shift in which only 8 min. were lost, 4 min. on re-dumps and shaker delays and 4 min. waiting on coal on the bottom.

"The average steam pressure on each of these days was 120 lb. gage. It may be of interest to add the following, which is the record of the number of hoists made in each consecutive hour throughout the day:

1st hour	195 hoists	5th hour	192 hoists
2d hour	190 hoists	6th hour	170 hoists
3d hour	188 hoists	7th hour	185 hoists
4th hour	192 hoists	8th hour	190 hoists

This is certainly a good record, even for a self dumping equipment in the shaft, and *Coal Age* will be pleased to learn of any record that will equal or surpass the one given. Such records show, not only the efficiency of the equipment, but indicate an equal efficiency in the mining and handling of the coal underground, including the work of gathering the cars at the work ing face, and hauling them to the shaft bottom.

The vast improvement made in the past ten and twenty years, in the management and operation of coal mines in Illinois, has established a record of which the state may well be proud and one that other coal-producing states could do well to follow. It is the result of the uptodate equipment of all the larger mines.

Errors in Surveying Practice

Kindly state, in the columns of *Coal Age*, what are some of the more common errors made by beginners in the work of surveying. I have been told that few engineers can measure off a distance of 1000 ft. and be sure of reaching the same point twice in succession. While this seems to me to be an exaggerated statement, I have found my own measurements to vary as much as 2 in. in that distance, although exercising my usual care in the performing work. SURVEYOR.

Des Moines, Iowa.

It is true that the measurements made by different engineers pulling a chain or tape over the same course will often vary surprisingly. There are a number of reasons for this: In the first place, all engineers do not exercise the same care in taking their measurements. Again, many engineers but more commonly surveyors do not realize the changes that occur in the length of a chain or a steel tape used in making the measurements and which may be caused either by the temperature of the steel or the pulling or tension exerted by the chainmen.

Of course, it is absolutely necessary to use a good steel tape when taking accurate measurements. Such a tape is usually graduated for a pull, of 10 lb. and care should be taken to approximate this pull when measuring. Again, when a steel tape is first run out, its temperature may be about 60 deg. F. In a hot sun, it requires but a short time for the temperature of a tape lying on the hot ground to increase a possible hundred degrees. I have known the tape to become so hot that it could not be held with comfort in the hand.

Now, taking the coefficient of linear expansion of steel as 0.000625, per 100 deg. F., a rise in temperature of 100 deg. would lengthen a 100-ft. tape $12(100 \times 0.000625) = \frac{3}{4}$ in. The lengthening of the tape this amount in 100 ft. would make the distance measured between two points 1000 ft. apart only 999 ft. $4\frac{1}{2}$ in., showing an error or difference in the two measurements of $7\frac{1}{2}$ in. This is one of the most common sources of error appearing when taking measurements over the same ground, in the summer and the winter seasons.

Another common source of error is caused by pulling too hard or not hard enough. A pull of 10 lb. on a 100-ft. steel tape, $\frac{1}{8}$ in. wide and $\frac{1}{64}$ in. thick, commonly used in surveying, will stretch the tape $\frac{1}{8}$ in. This is an interesting subject and there are many other errors to which we hope attention will be called by our readers who are interested in surveying.

EXAMINATION QUESTIONS

ANSWERED BY JAMES T. BEARD

Bituminous (Penn.) Firebosses' Examination, Apr. 11, 1919

(Selected Questions)

Ques.—Give the legal qualifications and state what other qualifications one should possess to properly perform the duties of fireboss.

Ans.—The Bituminous Mine Law of Pennsylvania (1911) requires a person seeking the position of fireboss, to hold a fireboss' certificate granted him by the examining board of the state, after he has successfully passed the examination given by the board. The law also requires that an applicant for a fireboss certificate must be a citizen of the United States, at least 23 years of age, of good moral character and known temperate habits. He must have had at least five years' practical experience after 16 years of age, as a miner or performing general work in the mine. He must also have had experience in mines generating explosive gas in Pennsylvania. Each applicant for a certificate must be able to read and write the English language intelligently and must furnish the board with a certificate testifying to his character and temperate habits and showing the length of his service in different mines. The law further requires the candidate to satisfy the board of examiners that he is able to perform the duties of a fireboss in gaseous mines. Besides receiving an average of at least 65 per cent. in the written examination, the candidate must undergo an oral examination in the presence of explosive gas.

In addition to the legal requirements just mentioned, a candidate for a fireboss certificate should have no physical ailment that will hinder him in the performance of his duties in the mine. He must be strong, have good hearing and eyesight, be conscientious and faithful in the performance of his work, honest in all his dealings with the company and with the men employed in the mine and possess the skill and courage required of a fireboss in the mine. He must also have a thorough acquaintance with and knowledge of the construction and use of the safety lamp.

Ques.—Name the various kinds of sign boards and danger signals authorized for use around the mine. State their special uses.

Ans.—There are danger signals and signs or warning boards to prevent men from entering places where danger exists, without due warning of its presence. There are also signs indicating the direction to be taken to reach the shaft bottom or mine entrance. Danger signals would seem to refer to any agreed signal transmitted into the mine and warning the men of impending danger. Such signals may be transmitted by telephone, signal bells or gongs, or by whistles blown at the surface by the hoisting engineer in charge at the time.

Danger signs or warning boards are of various kinds. They may be painted in bright red or the word "Danger" may appear in plain letters that can be easily read. In any case, such a sign warns men of their proximity to danger and is a reminder that they must not violate the mine regulations and rules. Firebosses frequently use a board or rail laid across the track, at the entrance of a room or near the face of a heading, as a warning to men to proceed no further toward the face. Such a board or rail may be marked with chalk to indicate danger. Chalk is also used by the fireboss, foreman, or assistant foreman to indicate a loose piece of top that is to be taken down and men are thus warned not to go under roof so marked. Signs indicating the direction to be taken in going out of the mine usually have the form of an arrow or are marked with an arrow pointing in the direction to be taken.

Ques.—Name at least four approved safety lamps and state what is meant by an approved safety lamp.

Ans.—One of the first lamps approved by the Federal Bureau of Mines was the Koehler lamp, both the steel and the aluminum type, then manufactured at Marlboro, Mass., and equipped with a "Macbeth, No. 2100, high-speed" glass and a pyro internal igniter, 1915 model. The Bureau of Mines next approved the Ackroyd and Best lamp, equipped with "ACK Best, A-1" glass and the Ackroyd and Best underground electric relighter. The Department of Mines at Harrisburg, Penn., has approved for use in that state, besides the two lamps just mentioned, the ordinary Clanny, the Davis deputy lamp, Wolf lamp, and a few others.

The term "approved safety lamp" refers to any lamp that has been examined, tested and approved, for use in mines, by a state or the Federal Government. Lamps approved by a state Government are approved for use in that state only, and the authorization does not apply to any other state. Authorization by the Federal Government is simply a gratuitous act on the part of the Government through the Federal Bureau of Mines, with a view to increasing the safety of mining operations. Such approval by the Federal Government does not prevent the use of other lamps in any coal-mining district or state. The matter of restricting the use of lamps in mines, in any state, can only be authorized through a properly constituted state board or mine official of that state.

Ques.—What observations would you make relative to the timbering of working places?

Ans.—Observe, first, that no coal is being loaded when one or more props have been knocked out by a blast and not been reset; and, second, see that sufficient timber of the right size is on hand in each place, and that all posts are stood properly according to the regulations of the mine, and the coal properly spragged.

Correction

Attention has been called to an error that occurred in the answer to the second question on page 970 of the issue, May 22, which should read 150 ÷ 0.9965 = 150,526 cu.ft. This makes the gas generated in 24 hr., 24 × 60 (150,526 — 150,000) = 757,440 cu.ft.

FOREIGN MARKETS AND EXPORT NEWS

EDITED BY ALEX MOSS

Diminishing Demand for Import Coal in Venezuela

Importations of coal to Venezuela have never been of very great importance. The figures for 1916 were: From the United States, 8507 tons; from Curacao (coal of American origin), 2031 tons; and from Great Britain 10,114 tons; total imports from all sources being 19,600 tons. In 1917 a total of 16,000 tons were imported, of which 8129 tons were from Curacao, 2039 tons from the United States and 6075 tons from Great Britain.

The importations of coal from England consist of Cardiff Crown briquets. These are ground coal compressed with some binding material into cubes of about 10 in. They can be stacked and counted and for this reason meet a demand that ordinary loose coal or small briquets can not fill, no matter how good in quality. In Caracas they have sold as high as $55 per ton. Formerly the railroads used them exclusively because they could be stacked upon the running boards of locomotives, thus avoiding the necessity of pulling a tender.

But the demand for these as well as for other sorts of imported coal is diminishing. The railways and the coastwise steamers are now using oil fuel, and some concerns having been forced to use Venezuelan coal, have found it better than they had thought. No bunkering is done in Venezuelan ports, that business in these waters being monopolized by the neighboring islands of Curacao and Trinidad, where labor is cheaper. The Venezuelan government operates coal mines near Barcelona and near Coro. Production appears to be stationary at about 20,000 tons per annum. A large deposit of coal near Maracaibo is being developed by an American company, and there is a prospect that Venezuela may be a large exporter of coal within a few years.

German Coal Trade

The subjoined information has been extracted from recent issues of the German newspapers by the *Iron and Coal Trades Review:*

The Minister for Economy, who refused to sanction the large price increases which the Westphalian Coal Syndicate decided to introduce Apr. 1, and who subsequently fixed maximum prices in the sense that the quotations which prevailed down to Mar. 31 were to be regarded as the maximum rates, has now been convinced by the Syndicate of the necessity for the particular increases which were proposed, and has sanctioned them with retroactive force as from May 1, subject to one condition. As now approved, the increase for coal is 20 marks per ton, including the coal and turnover taxes, with the exception of nut coals which are raised by 22 marks, while coke is increased by 30 marks and broken coke by 36 marks. The condition is that one-half (10 marks) of the coal price advance is to be placed to an equalization fund, which will be allotted to the pits which are working under the most unfavorable conditions. This arrangement is the same as that which was recently reached in regard to the collieries in Upper Silesia, and is now also being introduced in Saxony.

One of the articles of the peace treaty stipulates that Germany has to deliver coal to France for ten years to the amount of the difference between the production of the mines in the Nord and Pas de Calais before the war and the annual output in the ten years in question. In addition, Germany grants the right to France to receive 7,000,000 tons of coal per annum for ten years, to Belgium to obtain 8,000,000 tons of coal in 1919-20, and rising to 8,500,000 tons in 1923-24, at prices which are fixed in the treaty. It is permissible for coke to be supplied in place of coal in the proportion of three tons of coke to four tons of coal. Provision is also made for the delivery of benzol, coal tar and sulphate of ammonia to France for three years. The commission is empowered to postpone or cancel these deliveries should they be inconsistent with the industrial requirements of Germany.

It is reported that the government is engaged upon plans for prohibiting strikes by the introduction of a system of compulsory arbitration, as in Australia and New Zealand.

Coal Output in Scotland in 1918

The coal output in Scotland last year was 36,121,424 tons, a decrease of 2,355,526 tons, compared with 1917. The number of persons employed was 124,477. Of this number, 96,558 were employed under ground, and 27,919 above ground. In 1917 the number employed in coal-mining operations was 130,027.

Carrying Coals to Newcastle

If newspaper reports emanating from London convey the truth, then American coal operators who find business dull on this side of the ocean have been sending emissaries to Wales to find a market for their surplus product. The rumor hath it that some American salesmen, taking advantage of the state of the Welsh coal market and the need of the Welsh operator, are offering to fill orders for producers who are not in position to execute contracts on time owing to the shortage of raw materials and labor.

These agents are offering the prospective British customer coal placed on board at Newport News at $6.10 a ton, which is about half the price Welsh mines can deliver coal f.o.b. at any of the Welsh ports. In addition they are guaranteeing to deliver this coal at certain dates, which the Welsh collieries are unable to do.

In the Swansea manufacturing region, which is the center of Welsh industry, merchants and other coal consumers are being approached by the representatives of American coal shippers with a proposition to take care of British orders that cannot be supplied through the usual channels. The suggestion is made that any orders that cannot be executed will be filled by America to mutual advantage.

British Coal Output

Sir Auckland Geddes recently announced in the House of Commons that the output of coal per person employed in or about the mines continues to show a decrease. In the face of this England will either have to reduce the supply of coal to industry and for domestic use, or to limit even more strictly than at present the amount permitted to be exported. According to figures published in *The Times* (London), the output for the first three months of the present year is as follows:

Four Weeks Ended	Number of Persons Employed	Output, Gross Tons	Output per Person, Gross Tons
Feb. 1	1,064,828	18,321,100	17.2
Mar. 1	1,097,541	19,472,200	17.7
Mar. 29	1,106,299	18,676,200	16.2

On the basis of the figures the total production for 1919 would be about 224 million tons, as compared with 227,714,579 tons in 1918.

Discussing the question of Great Britain's coal supplies, the London *Times* remarks that it is extremely doubtful whether the great mass of the British people realize how serious is the position, even in the great industrial districts in the north. Manufacturers may expect to receive the same supplies as allotted to them up to the end of June, but after that a reduction of 12½ per cent is likely.

Holland in 1918 imported 1,259,144 metric tons only of coal and briquets, as against 2,661,390 tons in 1917 and 5,679,906 tons in 1916. On the other hand, she exported 113,757 tons of coal and briquets in 1918, as against 58,037 tons in 1917 and 82,158 tons in 1916.

Exports of Coal and Coke During April, 1919

Districts:	Anthracite Tons	Bituminous Tons	Coke Tons
Maine and New Hampshire	.....	.....	22
Vermont	1,833	1,356	48
St. Lawrence	73,195	90,419	4,132
Rochester	34,661	3,203	.....
Buffalo	158,220	160,361	10,277
New York	1,695	1,001	468
Philadelphia	1,856	7,807	.....
Maryland	90	76,408	5,886
Virginia	.....	211,313	.....
South Carolina	.....	3,181	.....
Georgia	.....	1,400	.....
Florida	.....	3,955	.....
Mobile	.....	47	.....
New Orleans	.....	941	3
Sabine	1	.....	.....
San Antonio	369	1,256	4,511
El Paso	176	1,385	3,317
Arizona	47	420	5,343
Southern California	.....	21	.....
San Francisco	.....	53	19
Washington	80	191	148
Dakota	336	1,944	183
Duluth and Superior	68	784	98
Michigan	.....	101,171	10,393
Ohio	12,563	142,511	35
Total	285,190	811,128	44,883
Countries:			
France	.....	.....	395
Italy	.....	32,309	.....
Netherlands	.....	31,106	.....
Sweden	.....	16,892	.....
Bermuda	.....	381	.....
British Honduras	.....	47	.....
Canada	282,217	501,940	25,336
Costa Rica	.....	.....	8
Guatemala	.....	103	3
Honduras	.....	665	.....
Nicaragua	.....	226	.....
Panama	.....	19,088	.....
Salvador	.....	.....	23
Mexico	593	6,200	13,171
Newfoundland and Labrador	404	.....	.....
Barbados	.....	16,514	.....
Jamaica	.....	5,251	.....
Trinidad and Tobago	.....	3,519	.....
Other British West Indies	342	.....	.....
Cuba	1,544	58,173	.....
French West Indies	.....	5,348	8
Dominican Republic	.....	670	.....
Argentina	.....	14,914	.....
Brazil	.....	70,333	.....
Chile	90	4,847	4,382
Colombia	.....	15	18
Peru	.....	4,968	1,537
Venezuela	.....	.....	2
New Zealand	.....	17,303	.....
Portuguese Africa	.....	316	.....
Total	285,190	811,128	44,883

BUNKER COAL

Districts:	Tons
Maryland	30,926
New York	259,671
Philadelphia	47,521
Virginia	140,741

Foreign Trade Summer Courses

Columbia University, New York City, has announced that it will give summer courses to those interested in foreign trade, as also will New York University. The course at Columbia University will be in charge of Prof. Guy Edward Snider and will consist of (1) Marketing Methods in Foreign Trade and (2) Economic Geography of International Trade. The course at New York University will cover (1) Foreign Trade Geography, (2) Methods in Foreign Trade, (3) Export Technique and (4) Foreign Exchange and Foreign Credits.

The Swedish State Railways and various gas works in Stockholm have bought 100,000 tons of American coal at prices somewhat lower than those at which English coal was offered.

COAL AND COKE NEWS

Harrisburg, Penn.

The bill requiring the delivery of explosives to miners (in the anthracite region) at points below the surface has been reported from committee, but with several amendments. The bill provides that on and after the first day of July, 1919, explosives to be used by the miners in the anthracite coal field shall be delivered to them by the operator of such mine or by his representative at a point below the surface most convenient to their place of work.

One of the amendments says that, "If any controversy shall arise between any miner, operator or foreman as to the points at which explosives are to be delivered, such controversy shall be referred to the proper mine inspector, whose decision thereon, taking into consideration practicability and safety, shall be final.

"Explosives shall be taken into the mines for the use of the miners and shall be there transported and stored under such rules and regulations as may be prescribed by the chief of the Department of Mines, and no greater quantity of explosives shall be taken into or held in any mine at any time than that necessary for delivery to the miners of such mine for one day's work."

Section two of the bill states that the quantity of explosives supplied each miner shall be in accordance with an order left by such miner at the mine foreman's office the day previous, the quantity not to exceed the amount provided by law.

The bill states further that any operator who shall fail, or neglect, or refuse to furnish explosives to miners as in this act provided, has committed a misdemeanor. An amendment has been added to this section which reads, "or who shall fail, or neglect, or refuse to furnish explosives to any miner as required by any decision of the mine inspector or who shall violate any of the rules and regulations adopted by the chief of the department under the authority of this act," shall upon conviction be sentenced to pay a fine of ten dollars for each such failure or neglect.

Lacking three votes of the necessary constitutional majority, the Flynn anti-sedition bill was defeated in the House on June 17. The vote was 101 to 84. Governor Sproul backed the measure and it was prepared by Attorney General Schaeffer. Though beaten in endeavoring to put the bill through, the proponents of anti-sedition legislation are jubilant at the showing made in the face of the stiffest possible opposition. There is hardly a doubt that the bill will go back on the calendar and enough votes be mustered to pass it by a substantial majority. Representative David Fowler, a national organizer for the United Mine Workers and floor leader for organized labor, led the battle against the measure, which he claimed was aimed directly at organized labor. Fowler's fight at times bordered on the sensational.

Nine men who were on the ill-fated trip of cars on the morning of the Baltimore No. 5 tunnel disaster, recovered from their injuries and recently discharged from the hospitals, were given a hearing on June 17 by the committee of investigation (six state mine inspectors) but no new light was thrown on the exact cause of the accident. All the men told of seeing the flash, followed by the fire, but were unable to say how the powder was ignited. The evidence shows that the causes have dwindled to smoking and electricity, but no definite testimony was received to prove that either of these caused the ignition of the powder. The pipe that was in the fatal car on the morning of the accident is the mute evidence that shows that some one was smoking.

Uniontown, Penn.

There have been three outstanding features in the industrial situation in the Fayette County or Connellsville coke region during the past week: (1) Demand for coke contracts from furnace interests. (2) Tightening up of the byproduct coal market. (3) Growing indications of an early labor shortage. Operators are giving quite serious attention to the labor situation which is expected to assume vital importance during the ensuing two months. A large number of workers, particularly Italians, have recently left for their native land and their absence will be felt materially with the return of normal conditions in the region. So far there has been no marked exodus of peoples of the Slav nations and in fact there is a strong movement on foot throughout the region to prevent these peoples from returning for some time, at least, in order to give the new republics, especially Czecho-Slovakia, an opportunity to get established firmly. It is pointed out that the difficulties there are such as to require the undivided efforts of the government with the population already there without being called upon to provide for the hundreds additional from the United States who are anxious to return and greet members of their families and relatives whom they have not seen or heard from since before the war.

While the inquiries for byproduct coal have been quite numerous during the week, no large contracts have been reported. The steam-coal situation is practically unchanged, plants which are in operation now working on a month to month basis. Expiration of June orders, however, probably will lead to a flurry during the last week of the month in placing orders for July business.

Demands for coke contracts are coming rapidly from furnace operations which are about to resume work. The favored plan just now is the placing of contracts on a sliding price range, with monthly revision, and upon a basis for coke of 5¼ or 6 to 1 as to pig iron. A few short-term contract deliveries are being made at around $3.50 to $3.90 while spot coke, quite scarce, is selling at around $4.00. During the week approximately 450 more ovens were placed in operation.

Charleston, W. Va.

If little or no headway is being made in increasing production in the various fields in the Charleston section, it is due not so much to general market conditions as to the inability of operations to secure enough cars. Such conditions have prevailed for about a month. For instance during the second week of June, mines were still unable to operate to capacity owing to car shortage but lately the supply has been somewhat better but still entirely inadequate to meet the demand. Added to the car scarcity is a shortage of miners tending to further curtail production; so that production in several fields of West Virginia was not over 75 per cent. and in some instances not that large, when in the face of a constantly increasing demand much more coal could and would have been mined. Conditions in the southern part of West Virginia reflect an even stronger market. There being, however, no sweeping advances, some kinds of coal even lagging behind in the procession. That was specially true as to ordinary steam coal, though the demand for it was better than had been true in earlier weeks. Mine-run is enjoying a better market while prepared sizes both in the smokeless fields and elsewhere are at a premium, in fact the output of a great many operations is sold as to prepared sizes. Pressure for coal from export sources is partly responsible for the increased demand, the movement of coal to tidewater during the week ended June 14 being especially heavy. An embargo in effect for a few days held down the lake tonnage, but with the rescinding of the embargo order coal again moved in large quantities to Lake ports. There appeared to be a much stronger demand for mine-run in western markets and that had its effect on slack coal which had been rather sluggish.

Under favorable transportation conditions the New River field would have been able to produce up to the capacity of its mines during the second week of June because market conditions for smokeless coal were conducive to a large output. However, the mines produced not more than 75 per cent. of the normal output. Export shipments were still growing in volume, though lack of vessels tended to hold down such shipments. Prepared sizes continue to advance and now approximate $5.00 a ton, it is stated, while mine-run is quoted at about $3.00 a ton and slack at from $2.35 to $2.75.

Production was greatly retarded in the Kanawha district, labor was scarce and it was not found possible to produce more than 60 per cent. of capacity. Much Kanawha coal was being shipped to tidewater. Prepared sizes were in prime demand and it was expected that a stronger market for mine-run would increase slack sales. The maximum price for prepared sizes was said to be $3.25, running from that down to $2.50 while the general average for mine-run, contract, was $2.25.

Fairmont, W. Va.

As an index to conditions in the Fairmont and other fields in the northern part of the state, on Saturday, June 14, shipments of coal from the Monongah division of the Baltimore & Ohio were larger (with one exception) than at any time during the present calendar year. The increase in shipments was most marked as to eastbound tonnage, more especially as to tidewater shipments and that means a steadily mounting export business. Much of the export business is being handled by the big companies who have the larger selling organizations, but some of the smaller companies are also participating. Only about 900 cars were loaded for Curtis Bay in four days, while the total loads of coal from Monongah division mines for the entire second week in June for all points reached a total of over 4800, it is estimated. Western shipments decreased in volume, the tonnage moving to Lake ports being below that of previous weeks. So far operators in northern West Virginia have not been troubled by a scarcity of cars or labor; fewer unconsigned loads were on hand. There was also a decrease in the number of idle mines and mines being operated were on a full-time basis. Run-of-mine (spot) was averaging over $2.00 while $2.50 and $2.60 per ton was an average price for prepared sizes. The price of slack ranged anywhere from $1.50 to $2.10, the average price being $1.75.

Huntington, W. Va.

There was an excellent attendance at the annual meeting of the West Virginia Coal Association held here on June 10. Aside from the election of officers for another year, the most absorbing question before the association was as to whether or not West Virginia operators favored a continuance of government supervision of the coal industry.

There was almost unanimous opposition to resuming the submission of monthly cost reports to the Federal Trade Commission, as such reports were not to be treated as confidential and, furthermore, it was considered that the submission of such reports was a phase of government control.

The executive committee at a meeting held after the adjournment of the annual meeting re-elected J. G. Bradley, of Dundon, as president; E. Drennen, of Elkins, as vice-president; Walter H. Cunningham, of Huntington, as secretary; A. H. Land, of Huntington, as treasurer. Mr. Drennen was the only new officer elected, succeeding G. H. Caperton.

After brief discussion the eastern car pool matter was left in the hands of the association's executive committee.

Terre Haute, Ind.

The production of coal in the mines of Indiana during May amounted to 1,307,325 tons, a small increase over April, which was 1,245,921 tons. The increase, while relatively small, is held by many operators in the coal field to indicate at least a start of a revival of the demand for fuel, inasmuch as the market ordinarily takes less coal during May, June and July than in any other months. The tonnage reported for May was produced at 197 mines, as compared with 189 during April. Several mines in the state are still closed; practically all are working only part time. A loss in production resulting from car shortage was apparent for the first time in several months, the loss from this source amounting to 84,587 tons. It was estimated that the full time capacity of Indiana mines during May would have been 2,887,372 tons, but it is not probable that this maximum production will be attained any month this year. Distribution of railroad contracts among many mines, instead of their concentration in a few has had the effect of more evenly distributing the working time of the various properties and, consequently, has improved, in a measure, the general working conditions.

Ottawa, Ont.

The final report of C. A. Magrath, Canadian Fuel Controller, was presented to the House of Commons on June 2. It emphasizes the necessity of devising every possible economic method of developing Canadian fuel resources. It would greatly help to maintain a favorable balance of trade if every effort were made to conserve and utilize to its full value all fuel brought in, and at the same time to develop the coal-export business in the maritime provinces, British Columbia and the West. The attention of builders, municipalities and others is drawn to the greater efficiency and saving in the cost of fuel obtained by the use of central heating plants in closely-settled parts of cities in the United States. The recommendation is made that the government should discourage the use of electrical energy for heating houses as being wasteful, considering that where used as power it has ten times the efficiency. Other recommendations are that classes for furnacemen should be held in each municipality to teach the conserving of fuel; that furnace manufacturers should be canvassed to see if they can be induced to make furnaces suitable for burning soft coal; to secure better building inspection of air spaces between walls to obtain protection against cold; that mines should be inspected to see that there is no waste in the extraction of coal; also provision should be made so that the cost of coal is not increased by over-capitalization, and that the report should be submitted to the consideration of the Advisory Council for Scientific and Industrial Research.

The Hon. A. K. Maclean, Acting Minister of Trade and Commerce, has issued a statement on the Canadian coal situation. He draws the attention of the public to the fact that owing to lack of orders many mines were forced to close down in the early spring, with the result that some seven million tons of coal, or one-twelfth of the yearly output was lost to the trade; there is, in consequence, a shortage of just that amount of coal with which to enter next winter. Under these conditions there is only one sound policy for the Canadian consumer to follow, both in respect to imported and also as to domestic coal. That is to keep pressing for supplies and to leave nothing undone until each consumer has at least a substantial portion of his next winter's supply in his cellar. The public need not look at present for a reduction in coal prices, as if there is to be any change every indication points rather to an increase.

Montreal, Que.

The first meeting of the special committees appointed by the Dominion Steel Corporation and the Nova Scotia Steel and Coal Co., to consider the possibility of reaching an agreement for the redistribution of the submarine coal areas leased by the two companies, were held here recently. It is stated that the following represented the Dominion company: J. H. Plummer, formerly president of the Dominion Steel Corporation; Hector McInnis, a director of the company, and William MacMaster, of Montreal. The Nova Scotia Steel and Coal Co. were represented by the following: D. H. McDougall, president; Colonel Cantley, chairman of the board, and W. D. Ross, vice president. It is of interest, says the Wall Street Journal, that Mr. Plummer heads the Dominion company committee, for when he was president of this company he recognized the ultimate necessity of some rearrangement of the various properties operated by the two companies. Mr. McInnis had charge of the entire undertaking before the Legislature of the Province.

If the companies in question fail to reach an agreement, then the Provincial Legislature will intervene and settle the matter in a manner which it may consider to the interest of the province. Many believe that the present negotiations may lead up to a possible merger between the two companies involved.

Victoria, B. C.

Joseph Hudson, of the Explosives Branch, Department of Mines, Ottawa, is making a tour of Canada on business of considerable importance to the mining industry. At present he is in British Columbia and has interviewed Hon. William Sloan, Minister of Mines, and other officials in the Department of Mines. He announces that it is the intention of the Ottawa authorities to provide the finances necessary for the installation at the Canadian capital of a powder-testing plant modelled after that of Cumberland, England, and Pittsburgh, Penn. At the present time there is no provision in Canada for the official testing of explosives used in the mines of the country.

The Provincial Government had been authorizing the use of those explosives passed by the United States Government authorities or recognized and approved by the British Government. If necessity arose for the testing of a certain grade of powder, and the coal dust of the mines in which it was proposed to be used, then it was necessary to send samples either to Cumberland or to Pittsburgh. With a plant at Ottawa, not only would a uniform list of authorized explosives be adopted in Canada, but it would be possible for all such testing and experiments to be carried out within the Dominion.

If the proposed plans are carried out it is understood that manufacturers of explosives will be required to submit their output to test in the official laboratory; also plans of new plants will have to be submitted to the proper authorities for approval.

Another innovation suggested is that regulations regarding the sale of explosives shall be uniform throughout the Dominion. This will be a marked improvement over the present somewhat haphazard method. Mr. Hudson's mission, therefore, is to lay these various proposals before the heads of the Mines Departments in the different provinces, explain them in detail, obtain suggestions and generally come to a clear understanding of the objects aimed at; then when Dominion legislation is finally drafted, it should meet conditions in all parts of the Dominion and be unanimously approved.

PENNSYLVANIA

Anthracite

Lansford—The Lehigh Coal and Navigation Co. will build a number of new tenament houses during the summer. The G. B. Markle Co., of Hazleton is also improving and rebuilding all its mine villages, putting the houses in first-class condition.

Shenandoah—The Continental washery, which has been idle since Feb. 8, resumed operations recently. The washery is owned by the Lehigh Valley Coal Co., and is one of the many washeries that were erected during the war to relieve the coal shortage. It has a daily output of 1250 tons.

Ebervale—Anthracite miners continue to be in demand. The G. B. Markle Co. announced on June 9 that it was still short of practical hands and is scouring the entire region for men holding certificates to mine coal. Efforts are being made to induce former residents of the Lehigh section now working in other parts of the state to return to their old occupations.

Shamokin—To prevent a tying up of its collieries between here and Mount Carmel, the Susquehanna Collieries Co. has inaugurated an auto bus service to convey the miners to and from their work. Practically all big trucks in Shamokin and Mount Carmel have been hired to make morning and afternoon runs to the collieries, during the strike of the trolley men.

Philadelphia—The Monash line of pressure reducing valves and pump governors, formerly manufactured and sold by the Monash-Younker Co., of New York and Chicago, has been acquired by the Harrison Safety Boiler Works, of Philadelphia. The Harrison Safety Boiler Works will manufacture and market the valves under the trade name "Cochrane-Monash," and will supply repair parts for valves now in use.

Inkerman—The electric storm on June 15 created havoc at the Red Ash shaft of No. 14 colliery of the Pennsylvania Coal Co., doing considerable damage, and it is likely that the Empire tower, which stands about forty feet high will have to be dismantled and rebuilt. The shaft has been abandoned for several months. It is equipped with modern machinery and after being sunk to the Red Ash seam, a distance of about 550 feet, it was decided by the officials to postpone underground development for an indefinite period.

Hazleton—It is stated that traces of a mine fire that existed in the Honey Brook No. 3 workings over a score of years ago have been discovered in the strippings at this plant several miles south of this place. The Lehigh & Wilkes-Barre Coal Co. operates the property.

Coöperating with the Government authorities, the coal companies are canvassing their men in an effort to ascertain their ideas regarding citizenship in this country. The information is also used in the collection of income taxes. A surprisingly large number of aliens seem to have no desire to take out citizenship papers.

Bituminous

Waynesburg—Paul B. Dick of Connellsville, has purchased several hundred acres of coal in Wayne Township, Greene County, from various owners.

Brownsville—William F. Ellwood, Susan Ellwood Mounts and Agnes Ellwood Brownlee, all of Washington, and E. E. Morris, of Waynesburg, have sold to the Pittsburgh Coal Co. two tracts of coal, one tract in Amwell Township containing 15.8 acres and the other in Canton Township, containing 108 acres. The price paid per acre was $300.

Scottdale—Organized play is to be an innovation this summer at the Phillips plant of the H. C. Frick Coke Co. For years past every Frick plant has had a playground with a band but the equipment at Phillips is to make provision for worth-while games which will appeal to the workers and their wives as well as the children.

Pittsburgh—The Hecla Coal and Coke Co. has been granted a permit by the United States Government to construct a steel tipple with a concrete pier and trestle supports on the right bank of the Monongahela River, 3.5 miles above Lock No. 6 at Rice's Landing and 72 miles above the mouth of the river. This plant is at the Isabella mine and is to replace the river tipple carried away by the ice winter before last.

Meyersdale—H. M. Habeeb and S. Silomon, both of Windber, have purchased 375 acres of coal land at this place from Aaron Cober and Joseph Lint. The land is near Keystone Junction and is underlaid not only with good coal but with several strata of sandstone. The new owners contemplate the development of a modern mining plant and the erection of a crusher to manufacture sand for commercial purposes.

Brier Hill—Officials of the Brier Hill Coke Co. made a trip to Fayette County, from Youngstown, Ohio, in a special train for the annual election of officers and inspection of the Fayette County operations of the company. All officers were re-elected as follows: President, Thomas McCaffrey; vice president, W. H. Warren; secretary, W. B. Phelan; treasurer, N. B. Folsom; directors, Colonel J. G. Butler, Jr., Thomas McCaffrey, W. H. Warren, G. L. Alderduce, John N. Allen and W. B. Phelan.

Pittsburgh—A dinner was given on May 27, by Dr. A. A. Hamerschlag, president of Carnegie Institute of Technology, at which a number of prominent coal operators were present. Announcement of a new Carnegie mining engineering department of the Institute was made at this time. Coöperation between all interests involved is promised. The operators were highly in favor of this plan and resolved that the gathering give its moral and material support to the form of education proposed by which students may receive combined technical, practical and business training necessary to fit them for service in coal mining.

Scholarships are offered; each operator whose production averages 1000 tons a day is to give one scholarship each year to young miners or sons of miners who cannot otherwise obtain such schooling. This school is expected to start next fall and an advisory board has been selected on which are prominent coal men.

WEST VIRGINIA

Clarksburg—Though yeggs succeeded in demolishing the general store of the Elkhorn Fuel Co. at its Ocean mines near here on June 4, through using too much explosives on the safe they succeeded in carrying off only a small amount of loot.

New River—The Buffalo Coal Co., recently incorporated with a capital of $75,000 has leased about 1000 acres of coal in this section, and plans the commencement of development work at an early date. It is said that the daily capacity of the plant will be about 800 tons. A. B. Day, John F. Shea, and M. T. Devault, all of Knoxville, are the incorporators.

Beckley—The Winding Gulf Operators' Association at its meeting at White Sulphur Springs, W. Va., went on record in a series of resolutions as favoring any movement for the advancement of the physical and moral welfare of the miners, the strict enforcement of the prohibition laws, better educational facilities, better schools and higher salaries, also the establishment of mining schools at various operations.

Huntington—A syndicate of this place, composed of C. W. Jones, W. E. Minter, J. B. Purcell, A. J. King, C. P. Donovan, E. J. Payne, John Clapperton and S. J. Hyman, recently closed a deal with the Hutchinson Lumber Co. involving the transfer of 2500 acres of coal land in Fayette County. Two mines are now in operation on the tract and a third is being opened up by the Greenbrier Collieries Co., in which the Hutchinson company held a fourth interest.

Charleston—The Turkey Knob Coal Co. is seeking an injunction to restrain the state tax commissioner from collecting additional amounts which he claims are due from all corporations in the way of an excise tax owing to the increase by the legislature of the rate by one fourth of one per cent. The effort of the Turkey Knob company to secure the injunction is in effect a notice of an appeal from the decision of the State Board of Public Works which sustained the Tax Commissioner in his ruling that the increase applied to the state's fiscal year beginning July 1, 1918, and ending June 30, 1919. The Turkey Knob company applied to Judge Rummell, of the Kanawha Circuit Court for the injunction but he refused it and it is now the understanding here that the company both on its own behalf and on behalf of others will apply to the Supreme Court of the state for an injunction. In fact a chancery suit has already been filed in the Kanawha Circuit Court as to just what period of the year the increase applies. A quarter of a year's additional excise tax is due according to the Tax Commissioner.

KENTUCKY

Louisville—The W. E. Caldwell Co., of this place, tank manufacturers, will build a 30,000 to 35,000 cut band saw mill in St. Landry Parish, La., where the company owns large tracts of cypress, ash, oak and gum timber. J. B. Crawford, an experienced saw mill man is connected with the enterprise.

Lexington—The Kentucky Mining Institute recently elected officers as follows: H. M. Ernst, Sturgis, president; C. W. Strickland, Ashland, secretary-treasurer; vice presidents, Alex Frost, Wilton; J. P. Gorham, Lexington; J. H. Hall, Whitesburg; H. H. Small, Chicago; A. G. Spillman, Earlington; R. C. Thomas, Paintsville; H. H. Townsend, Athens, O.; Louis Frances, Crofton.

OHIO

Columbus—A new bill of lading which goes into effect on all railroads, Aug. 8, does not limit the liability of carriers to the cost of the coal at lading and also does not place responsibility for coal cargoes on the owner, when held by railroads as warehousemen. In other words where the coal is on track in storage which is paid for, the railroad company must assume all losses.

Martins Ferry—The Fred R. Jones Construction Co. of Chicago, which is constructing the sidetrack for the Pennsylvania railroad from the W. & L. E. to the new Youghiogheny & Ohio mines on Little Short Creek, Jefferson County, has taken the contract for loading the 30,000 tons of coal piled near the Bud mine. The company has been piling coal beside its Bud opening since the first of the year at the rate of 200 tons a day, as it was impossible to load on the railroad until the branch line was put in. The Jones company will use steam shovels to load the coal.

The construction company is expected to be at work all summer in completing the contract of laying the branch railroad on up the creek to the new Dorothy mine.

ILLINOIS

Hallidayboro—The Jackson Coal Co. is now installing a new 150 k.w. electric generator at its mine to take the place of the one formerly used, which was too small to supply the demand. New storage battery motors were recently put into use at this mine. The new generator will be driven by a corliss engine.

Chicago—A warning that America faces a possible coal shortage more serious than that of eighteen months ago was sounded recently by a special committee of the National Coal Association, whose membership produces approximately 75 per cent. of the country's bituminous coal.

The committee, headed by F. C. Peabody, of Chicago, pointed to the production decrease of 50,000,000 tons from January 1 to May 10, as compared with a year ago, declared there are grave dangers of a labor shortage, and urged that consumers place their orders now, and thus set the idle mines in full swing again.

Sesser—Final plans are now being completed for the sinking of a new mine near here on the Chicago, Burlington & Quincy R.R. The company which will prosecute the work was recently formed with a capital of $5,000,000. The members include several prominent business men of Sesser and also Jesse Diamond of Chicago, D. M. Parkhill of Benton and Thomas Horn of St. Louis, all of whom are interested in the Modern Coal Co. The Modern Coal Co. recently completed a new mine at Sesser which ranks among the most modern in southern Illinois. The mine which this new concern is now planning will also be large and well equipped.

Springfield—Coal mines in the Springfield district are working as follows: The Peabody No. 6, one of the large mines of Central Illinois, employing more than 500 men, is working steadily. The Girard and the Capitol mines are down, the Athens mine is working four and five days and the Spring Creek mine averages about five days a week. Other mines which are putting in good time are the New Citizens, with an average of four days a week, the Klondike, working an average of three or four days, the Woodside working four and five days, the Panther Creek, about two days and the Divernon and Auburn mines about four days a week. The Tuxhorn mine, which has been down, will open July 1.

Zeigler—This place promises to be one of the largest mining towns of southern Illinois. Another new mine has just been sunk near the old plant of Bell & Zoller. These mines are the only ones in the southern part of the state which are said to be working full time. Ample facilities, such as water, light and power are supplied by the large mines which are located close to the town. A new and modern hospital is maintained and the city is to have, in the near future, one of the best labor temples of this section. The local union of miners at Zeigler recently held a labor picnic and celebration at which there were about 5000 persons present. The speakers were: Frank Farrington, president of the United Mine Workers of America, Mother Jones and Edward Carbine, of the Illinois State Federation of Labor. A part of the celebration was in the form of a big parade; dinner was served at the city park.

ALABAMA

Birmingham—The Alabama Fuel and Iron Co. of this place has completed negotiations for the purchase of a tract of about 1640 acres of coal and is said to be planning for development. The new property is located in Harlan County, Ky. Charles F. De Bardeleben is vice president and general manager.

Alabama produced 19,521,840 net tons of coal and 4,344,726 tons of coke during 1918, according to figures compiled by Chief Mine Inspector C. H. Nesbitt for incorporation in his annual report. Compared with the record production for 1917 of both coal and coke, there was a decrease of 891,971 tons of coal and a shortage of 523,872 tons of coke. Jefferson County, producing over half the coal tonnage for the state in 1917 and 1918, fell below the 1917 record by 980,109 net tons.

MISSOURI

St. Louis—Shipments of coal into this city last year were 1,052,283 tons in excess of the preceding year and 4,933,700 in excess of 1915, according to the annual report of the Merchants' Exchange. The receipts of coal here were as follows: In 1918, 12,905,755 tons; in 1917, 11,853,472 tons; in 1916, 9,683,806 tons; in 1915, 7,972,055 tons. The receipts of anthracite, included in the report, were 64,515 tons in 1918, against 163,789 tons in 1917. The receipts of coke were 168,205 tons last year, against 217,236 tons in 1917. Of the receipts of anthracite, 48,436 tons were local and 16,0[illegible] through. The Illinois Central carried the greatest tonnage, 1,787,691; the Southern was next with 1,400,248; the Louisville & Nashville was third with 1,247,660 tons.

Personals

Arthur King Wood, formerly president of the Franklin Trust Co., has been elected vice president and treasurer of Westinghouse Church Kerr and Co., of 37 Wall St., New York City.

Herman T. Garrison has resigned his position with the Madison Coal Corporation at Carterville, Ill., to accept one with the Hartwell people who operate a new mine at Hartwell, Ill.

C. F. Bashore, formerly manager of the New England Fuel and Transportation Co., Grant Town, W. Va., has accepted a position as manager of an operation of the Randall Coal Co. along Scott's Run.

John Chisnell, mine foreman at No. 5 colliery of the G. B. Markle Co., was seriously injured by a runaway car recently. His assistant, Charles Tyson, also sustained a fractured leg in the same accident.

Harold M. Stagg, formerly New York sales manager for Weston Dodson & Co., Inc., has been appointed general manager of sales of the Pennsylvania Collieries, Inc., with offices at 500 Fifth Ave., New York City.

Charles Gottschalk has resigned his position as chief engineer for the Union Colliery Company, at Dowell, Ill., and has been succeeded by W. T. Detweiler, of St. Louis. Raymond J. Dowd, also of St. Louis, will be assistant engineer.

Robert H. Kann has been appointed superintendent of Mine No. 24 of the Consolidation Coal Co., having been superintendent at the No. 55 mine of the company. For the time being J. H. Nuzum will act as superintendent at Mine No. 55.

Col. William Leckie, head of a number of coal companies operating in the Pocahontas region has purchased the Kelley & Mayer Building in Bluefield, W. Va., and will use it as the headquarters of 10 different companies in which he is interested.

C. S. Coler, especially fitted by education and experience, was recently appointed manager of the educational department of the Westinghouse Electric and Manufacturing Co. He is also president of the Casino Technical Night School and chairman of the technical sections of the Westinghouse Club.

Samuel F. Joor, a consulting engineer of Chicago, has joined the American Steam Conveyor Corporation, Chicago, in the capacity of sales engineer. Mr. Joor has had wide experience in the conveyor field, at one time being western manager and sales engineer of the Jeffrey Manufacturing Co. and previous to that, with the Link-Belt Company.

High appreciation of the work of **Lieutenant-Colonel C. W. Watson,** president of the Consolidation Coal Co., as an ordnance officer in France, has been expressed by General John J. Pershing, head of the American Expeditionary force. In a letter addressed to Colonel Watson, General Pershing says, "I wish to express my appreciation of the valuable services which you rendered the American Army as Base Ordnance Officer of Base Section No. 6. You performed tasks of magnitude, constantly surmounting unexpected difficulties and solving perplexing problems with sound judgment and initiative. At all times you were devoted to your important duties and untiring in the energy with which you unfailingly acted. I regret that I was unable to thank you personally before you returned to the United States."

Obituary

Charles Binkley, age 53, a coal operator of southern Illinois, recently died from heart failure at his home in Marion, Ill. He had been suffering with pneumonia for several weeks.

Burr E. Cartwright died on June 17 at his home in Buffalo, N. Y., in which city he was born in 1850. He was interested in the Shawmut Mining Co., whose property he developed.

John J. Broderick died on June 7 at St. Louis, Mo. Mr. Broderick was president of the Broderick & Bascom Rope Co., whose product is used in and around the coal mines throughout the country.

Philip M. Hucke, age 49, died at his home in St. Louis, on June 19. He was general manager of the Kolb Coal Co., St. Louis, and also manager of the St. Genevieve Lime Co. Mr. Hucke was a member of the St. Louis Chamber of Commerce and prominent in the masonic fraternity.

Major Granger Farwell, chairman of the board of directors of the Monarch Coal Mining Co., of Monarch, Wyo., died suddenly in Chicago, May 15. He is survived by a widow and five daughters. Major Farwell entered the army when this country declared war and served until Jan. 10, of this year. Besides being connected with the Monarch company, he was a director of the Diamond Match Co., Utah Gas and Coke Co. and other institutions.

MAJOR GRANGER FARWELL

Coming Meetings

American Institute of Mining and Metallurgical Engineers will hold its fall meeting Sept. 22 to 26 in Chicago, Ill. Chairman Chicago meeting, Carl Scholz, 547 West Jackson Boulevard, Chicago, Ill.

Northeast Kentucky Welfare and First Aid Association will hold a first-aid contest July 4 at Pikeville, Ky. Secretary, E. H. Sowards, Pikeville, Ky.

The Rocky Mountain Coal Mining Institute will meet in Salt Lake City the second week in July, 1919. Secretary, F. W. Whiteside, Denver, Colo.

Mine Inspectors' Institute of the United States of America will hold its annual meeting July 8 to 11 at Indianapolis, Ind. Secretary, J. W. Paul, Pittsburgh, Penn.

The National Commissary Managers' Association will hold its annual meeting August 5-7 at the Sinton Hotel, Cincinnati, Ohio. Secretary, D. J. Eichoff, Manhattan Building, Chicago, Ill.

Pennsylvania Retail Coal Merchants' Association will hold its annual meeting July 23 and 24 at Reading, Penn. Secretary, W. M. Bertolet, Reading, Penn.

National Exposition of Chemical Industries will hold its fifth annual meeting at the Coliseum and First Regiment Armory, Chicago, Ill., during the week of Sept. 22. Manager, Charles F. Roth, 417 South Dearborn St., Chicago, Ill.

The National Safety Council will hold its annual meeting Oct. 1 to 4 at Cleveland, Ohio. Secretary, S. J. Williams, Chicago, Ill.

Industrial News

Cincinnati, Ohio—The B. A. Vesche Electric Co., of 327 East Sixth St., of this place, announces that the address of its eastern sales agent is 110 West 40th St., New York City.

Cleveland, Ohio—The Sullivan Machinery Co. announces the establishment of a new branch office at Room 810 Park Building, Cleveland, Ohio, under the management of Ralph T. Stone, for several years past sales engineer associated with the New York office of the company.

Huntington, W. Va.—The Link-Belt Co., of Chicago, has opened a new office at this place. George S. Jaxon, one of the company's engineers, who for many years served the West Virginia field, has been made district manager with headquarters in the Robson & Prichard Building.

New York, N. Y.—The Dominion Asbestos and Rubber Corporation, with executive offices at 154 Nassau St., New York City, has recently opened branches in Albany, N. Y.; Atlanta, Ga., and Allentown, Penn. In January, 1919, the capital stock of the company was increased to $100,000.

Petersburg, Ind.—The Gladstone Coal Co., which operates the Gladstone coal mine, three miles north of this city, on the Evansville & Indianapolis R.R., is completing a new tipple and will increase the working force to 100 men within the next few months. Electric power will be used.

Oil City, Penn.—The Oil City Oil and Grease Co., of this place, has been authorized to increase its capital stock from $80,000 to $200,000. D. J. Cavanaugh is treasurer. This expansion means increased business and reflects most favorably on the excellence of the products of this company.

Yorkville, Ohio—The erection of 47 houses was begun at the Dorothy mine of the Youghiogheny & Ohio Coal Co., west of here, recently. This will make a total of 100 houses at the Dorothy and Bud mines. It is said the number will be doubled eventually. A large store building will also be erected.

Pittsburgh, Penn.—The Safety First Supply Co., of this place, has found it necessary to move to larger quarters on account of the continued increased business of the company. The entire building at 107 Third Ave., Pittsburgh, is devoted to the manufacture and distribution of appliances for safety first aid and welfare.

California, Penn.—Extensive additions and enlarged operations at the Vesta mines of the Jones & Laughlin Steel Co. are being planned as a result of the completion of the first battery of byproduct ovens at the big steel plant. Operations have been resumed at Vesta No. 4 after a four months' shut down.

Huntington, W. Va.—C. W. Jones, W. E. Minter and associates have recently completed arrangements for the purchase of coal properties in Fayette County, and are planning for extensive development at an early date. The tract comprises about 2500 acres. It is understood that the plans provide for an annual capacity to exceed 200,000 tons.

Olcott, W. Va.—The General Underwriters, Inc., has acquired the Penn-Virginia Coal and Coke Co. and the Black Band Fuel Co., the latter being a well known company in Kanawha County where the formal transfer was made. The consideration was approximately $100,000. A further development of the Black Band property is insured.

Pruden, Tenn.—The Pruden Coal and Coke Co., of Knoxville, is understood to be planning the development of approximately 2500 acres of coal properties located in the Pruden district. Complete equipment for an up-to-date plant will be installed. It is proposed to have an initial capacity of about 300 tons daily. V. M. Hacker is president.

Cincinnati, Ohio—Goodin, Reid & Co. of Cincinnati, Ohio, has changed its name to Goodin, Reid and Co., of New York, and has removed its main office from Cincinnati to 41 Union Square West, New York City. The company will still maintain its Pittsburgh office at 913 Farmers Bank Building and shipments will continue to be made from Cincinnati.

Washington, D. C.—According to Railway Administration figures the mines and oil wells of the United States furnish 55.75 per cent. of the tonnage hauled by the railways. The material manufactured from ores and minerals produced from American mines and oil wells furnish 25 per cent. of the remaining tonnage. This ratio has existed in a greater or less degree for many years.

Buffalo, Tenn.—The Buffalo Coal Co., of Knoxville, recently incorporated with a capital of $75,000, is arranging for the commencement of work at an early date on the development of approximately 1500 acres of coal properties located in the Buffalo district. It is understood that the company's plans provide for an initial capacity to exceed 500 tons per day. A. B. Day is president; and Milton T. DeVault, secretary.

Taylorville—The shaft of the Springfield Coal Co. has been closed down indefinitely. The mine has been working only one day a week since January 1 and the shutdown will not mean a great loss to the miners, except that they had been holding on with the hope that there would be an abundance of work in the future. It is believed that there will be no more work at this mine until fall. The other mines in the Taylorville vicinity are working full blast, extra men being required at a number of the mines.

Coalwood, W. Va.—Arrangements are being made by the Carter Coal Co. for extensive improvements at its various plants. The plans include the construction of a large new steel tipple and automatic hoist at the Coalwood works, as well as the construction of a number of new miners' houses; improvements at the Seaboard and Coaldon plants, and other work to increase the present capacity. At the present time the company's holdings approximate 40,000 acres of coal properties located in four states. J. W. Carter is vice-president.

Fairmont, W. Va.—The Domestic Coke Corporation is making rapid progress on the installation of its large new local plant, estimated to cost in excess of $3,000,000, and it is expected that construction work will be completed by the first of the coming year. The plant will comprise a battery of 60 Koppers ovens with byproduct recovery apparatus, to have a daily carbonizing capacity to exceed 1000 net tons of coal. The Koppers Co., Pittsburgh, Penn., is the contractor. Charles V. Critchfield, Cleveland, O., is vice-president of the corporation.

Palmer, W. Va.—A million-dollar firm to be known as the Jones By-Products Coal Co., has been organized by well known Delaware and Pennsylvania business men to operate at this place in a comparatively undeveloped region. While the plans of the company have not been made public it is understood that a large byproduct plant will be constructed and operated. The company was organized by Robert H. Jones, of Wilmington, Delaware; H. Chester Johnson, John E. Bassett, and Randall F. Collins of Philadelphia and John M. L. Black of Villa Nova, Penn.

MARKET DEPARTMENT

EDITED BY ALEX MOSS

Weekly Review

Good Grades of Bituminous Coal Already Contracted For—Present Is Best Time to Purchase Fuel—Anthracite Domestic Sizes in Good Request—Production Inadequate to Meet Demand, Which Is Insistent

THE disinterestedness evinced by many large consumers of bituminous coal at the present time can lead only to one result this winter—a coal shortage. Mines are still losing on an average of two days a week because of lack of orders. The rate of production is at present about 30 per cent. below that of last year, and is only sufficient to take care of current consumption.

Operators still hold fast to the belief that the signing of peace will bring in its wake the long-expected activity for American industries, and that many large consumers will thereupon change their present lackadaisical attitude toward their future coal needs.

Business, however, is picking up, though slowly. It is not at all improbable that the next few weeks will witness the inauguration of a new era in market conditions. No contracts are being signed, and those concerns that have failed to cover themselves for their future requirements will find when they come into the market not only higher prices, but a dearth of the good grades of soft coal, the output of which for the coming year has already been contracted for.

Add to this the by no means remote possibility of labor trouble at the mines, labor shortage, inadequate car supply, higher freight rates and poor transportation conditions—and the reasons why the immediate moment is the psychological time for the purchase of coal become readily apparent. In a short while the complexion of things will have changed.

Medium and low grade coals move slowly. Producers of the better grades are refusing new business. Gas coals are in good request, and the export coal situation is improving. The general average of market prices is on about the same level it has occupied for the past month.

During the week ended June 14 there was produced 8,782,000 net tons of bituminous coal as against 8,917,000 net tons for the preceding week.

Demands for the domestic sizes of anthracite are nothing short of strenuous. The cry for egg and stove coal is most insistent. Chestnut, also, is coming in for a goodly share of the favor shown toward the larger anthracite coals at this time. The mines are working steadily, but the output could be much greater if sufficient labor were available. Many anthracite mines are now producing at only from 60 to 65 per cent. of their maximum output capacity.

Good tonnages of hard coal are moving to Canada, to the West, and to New England points. Efforts are being made to prevent a serious shortage of anthracite in any section of the country next winter As in former years, those sections more remote from the source of supply are being catered to first.

During the week ended June 14, about 1,685,000 net tons of anthracite were mined, bringing the total output for the calendar year to date up to 35,180,000 net tons compared with 44,890,000 net tons in the corresponding period of last year.

WEEKLY COAL PRODUCTION

A slight decrease in the production of bituminous coal was recorded for the week ended June 14 The estimated output is 8,782,000 tons, compared with 8,917,000 tons in the first week in June, and 8,724,000 tons in the week ended May 24.

The best time in the year for laying in stocks of coal for next winter is rapidly passing, with no evidence of general buying for this purpose. The rate of production has not varied greatly since the middle of May, and averaging about 30 per cent. below last year, is apparently just sufficient to meet current consumption.

The production of anthracite in the week ended June 14 is estimated at 1,685,000 net tons, about the same as the preceding week, but nearly 15 per cent. below the estimated output for the corresponding week of 1918. The total production for the calendar year to date is estimated at 35,180,000 tons, compared with 44,890,000 tons in the corresponding period of last year.

Reports from the operators for the week ended June 7 show no general improvement in the market for bituminous coal. The mines lost on the average two days in the week because of lack of orders, which is a slightly smaller loss on this account than in May. With the exception of a few districts the railroads are giving practically full car supply, but in both the smokeless and high volatile fields of southern West Virginia car shortage is already becoming a limiting factor. Several districts, however, reported to exceed 80 per cent. full-time operation; the Pittsburgh, Westmoreland and nearby fields and Somerset reaching that mark for the first time this season.

The production of beehive coke in the week ended June 14 is estimated at 297,500 net tons, compared with 271,400 tons in the week ended June 7, a gain of about 26,000 tons, or more than 9 per cent. Although the production of beehive coke has been slowly but steadily increasing in recent weeks, at the present rate of production it is less than 45 per cent. of that of the first half of June, last year. The increase in production in the week ended June 14 was general. Colorado and New Mexico in particular recorded an output nearly twice that of the first week in June.

The shipments of lake coal continue to exceed the million-ton rate per week. The total dumpings in the week ended June 7 are reported at 1,074,000 tons, nearly 70,000 tons greater than the previous week, and more than 300,000 tons, or 41 per cent. greater than the corresponding week of last year. The total lake coal dumped to June 7, this year, exceeds the total for the corresponding period of last year by nearly 1,200,000 tons, or 25 per cent.

BUSINESS OPINIONS

Marshall Field & Co.—Current wholesale distribution of dry goods ran about the same compared with the corresponding week of 1918. More customers were in the market than during the comparative week of last year. Retail business continues excellent. Orders from road salesmen for both immediate and future delivery were much greater in volume than for the corresponding week of 1918. Collections are satisfactory.

The Iron Age—Volume of new business and rate of production in steel has undergone little change in June. The improvement of three weeks ago has been held, without the signs that usually attend a regulation buying movement. The amount of new manufacturing capacity that is projected in metal-working lines in the Middle West, particularly in the Detroit district, and the repair and new construction work laid out by a number of steel companies, are outstanding features.

Dry Goods Economist—The export demand for American textiles continues to grow. The call for certain goods now exceeds the capacity of the mills that produce them and has made it necessary for exporters to seek the aid of jobbers and converters in order to make shipments. One leading printer of cotton fabrics is said to have export orders for 10,000 cases of goods. A heavy demand for raw cotton and for cotton fabrics is anticipated, but for the present there is limited activity among dealers in the staple.

American Wool and Cotton Reporter—On the basis of supply and demand, the wool industry is in a stronger position than in the past, and therefore the profit margins are likely to be more regular and somewhat larger. No great change in the situation is looked for until the buying power declines greatly, or the supply is largely increased, and neither of these changes is anticipated soon. Raw cotton has been particularly weak during the week under review with a decline running up to about $20 per bale. The decline was rather unexpected by many, but is perhaps justified on the basis of the rapid advance which had occurred and because of the uncertainty as to the consumption of cotton in other countries.

Atlantic Seaboard

BOSTON

No distinct price movement as yet. Steady improvement, however, in general situation. The trade notices a disposition to stock coal. Gas slack quoted at low figures. Navy Department arranges for a "pool" at New York. Little demand at New York and Philadelphia piers. Hamp-

ton Roads resumes dumping on settlement of trainmen's strike. Anthracite behind on shipments.

Bituminous—Although there have been scattered instances where select grades have been sold at prices slightly advanced, there has yet developed no pronounced upward movement. The market here seems more than anything else to be "marking time." While this is not unusual in New England for the early weeks of summer, the trade really anticipated a much more active market in June this year. There is still room for a good deal of optimism, however, for the business boom is coming and not for any extended period in the future will 50 per cent. output be enough to run the railroads and turn the wheels of industry. The present state of the market only goes to show that this territory was more heavily overstocked than was supposed, and that even now there are large plants taking current supply from the mines and having still untouched large reserves that were accumulated last season. So long as mining continues on the present basis, without material loss of tonnage, There are no surface indications of shortage the coming season, so far as this territory is concerned. The rub is expected to come when either present output can no longer be maintained, or other sections of the country increase their requirements.

The undertone continues decidedly favorable to a more active market, slow as it may appear in coming. Buyers find that special kinds of coal are not so easy to secure and there is more or less maneuvering to get shippers to agree to contracts. Operators have shown more disinclination the past fortnight to sign up for extended delivery, and even September orders are not sought in the same eager fashion that was characteristic but a few weeks ago. Certain shippers are beginning to say they would rather not take business, at least for the present, and wait for developments later on when higher prices seem assured. There are still steam-users of importance who have not yet bought for fall and winter, but these are exceptional cases. The bulk of the buying hitherto has been to meet only part requirements, leaving it to later in the season to secure the balance needed. It is some of this kind of purchasing that is being done now and on which slightly higher prices have been realized. So far as prices go there is less questioning among buyers; their effort has been directed more to getting suitable fuel, and the gain in this respect is very great. Not in years has there been such discrimination between different grades.

There are a good many smaller buyers, 10,000 tons and less, who are already beginning to stock coal. Many of them were hoping to rely upon steady shipments during the next six or nine months, but there are so many uncertainties that they concluded to take the more prudent course. Certainly it would be hard to figure out how coal is going to cost any less between now and next April. It seems pretty well established that the Government will not increase freight rates, but it is at least equally certain that under private management the railroads will seek to recoup themselves if costs continue to mount.

Slack coal has been freely offered the past week, in part reflecting the better demand for prepared coal in other markets and also indicating the market preference of buyers here for the low volatile coals. The Fairmont gas coal shippers are especially active with spot prices as low as $1.40 per net ton. They are at a disadvantage in tariffs, however, for in a considerable part of this territory they are under an adverse differental of at least 35c., and in other cases 60c., for there are producers of slack in Central Pennsylvania who can ship at the minimum Clearfield rate. In the Pittsburgh region prices on slack are almost as low as in Fairmont, several quotations of $1.50@1.60 having been made.

It is understood that the Navy Department has arranged for more than 20 different coals to be shipped regularly to a Navy "pool" at the New York loading piers. This is recognized as an effort to keep coal in steady supply for all requirements and emergencies. Perhaps no better line could be had on the prospective market for steam coal than the official attitude indicated by this move. It is conceded that several coals have been given classification in Pool 71 (coals on the Navy supplementary list) that in normal times would hardly be requisitioned for Navy purposes, but with the outlook as at present the authorities could not prudently do otherwise.

At the New York and Philadelphia piers there is no improvement in the spot market. The quality grades are held firmly and usually are sent from the mines only on staple business, but on the medium and fair coals there is almost no movement worth mentioning. All-rail delivery has the call in most of New England and almost it seems as if the market for water coal were being increasingly restricted. The higher grades from Pennsylvania costs nearly as much alongside in our harbors as the smokeless coals from Hampton Roads, and where both coals are accessible the latter are likely to have the preference at any moderate differential.

The trimmers' strike at Norfolk was settled and service resumed on the 16th instant. Much inconvenience was caused the several shippers but the market here can hardly be said to suffer for any lack of coal in consequence. Prices are firmer, however, and now that practically all the tonnage has been sold that could readily be placed on the lower figure there is a disposition to adhere to the $5.14 basis f.o.b. vessel. Much is said about the enormous demand expected overseas when peace is signed, and of course there is a steadily increasing tonnage loaded for export; but there has been no distinct trend of prices upward, as yet.

Current quotations on bituminous at wholesale range about as follows:

	Clearfields	Cambrias and Somersets
F.o.b. mines, net tons	$2.15@2.75	$2.75@3.35
F.o.b. Philadelphia, gross tons	4.27@4.95	4.95@5.50
F.o.b. New York, gross tons	4.62@5.29	5.29@5.85
Alongside Boston (water coal), gross tons	6.10@6.85	6.90@7.35

Georges Creek is quoted at $3.20 per net ton f.o.b. mines.

Pocahontas and New River are being quoted at $5.04@5.24 per gross ton f.o.b. Norfolk and Newport News, Va. Alo .gside Boston the same grades are being offered at a range of from $7.24@7.44, and on cars Boston and Providence at from $7.50@7.90 per gross ton, the latter being the contract price f.o.b. cars for deliveries to April 1.

Anthracite—On domestic sizes the demand continues most insistent. A slight easing up on chestnut has been noticed lately, but on egg and stove the movement is extremely slow whether by rail or by water. There is not this year the strong arm of the Fuel Administration to favor New England on anthracite, and all the shippers are faced with extraordinary pressure to get coal forward to all sections and a much less tonnage for distribution. The larger cities, too, have increased their needs because of large increases in industrial population.

NEW YORK

Heavy demand for domestic sizes of anthracite continues. Canadian dealers offering inducements for coal. Heavy tonnages being sent into the West. All-rail trade heavy. Steam coals long in supply with prices easy. Local bituminous market dull, but line trade picking up. Prospects bright for better business soon. Contracting nearly ended. The better grades of bituminous coal in demand. Exporters report good business.

Anthracite—Conditions in the local market are strenuous. The quantity of egg, stove and chestnut, particularly the first two named, received here is far too small to meet the demands of the trade. The call for these coals remains strong and dealers are booked far ahead.

Production maintains its usual level. The mines are working steadily, but because of the lack of the required labor to mine the coal the output in many mines is only from 60 to 65 per cent. of what it should be. However, the production figures for the past few weeks show a steady increase, but a vast decrease as compared with a year ago. An effort is being made by the selling agents to distribute the supplies equitably in the hope of preventing a serious shortage next winter in any section of the country.

The demand from the West and from Canada continues heavy with no let-up in sight. Heavy tonnages are being sent forward. It is reported that some Canadian dealers are offering inducements for quick shipments. Shippers covering the New England states say there is a big demand there and that a good tonnage is going forward both by rail and by water.

Dealers handling all-rail coal are in the market for heavy supplies of the domestic sizes. They are complaining of slow shipments but are better situated with respect to stocks than the city retail dealer, inasmuch as most of them have facilities for storing coal which the local dealer does not possess.

Selling agents and shippers are top-heavy with orders for the larger sizes, many of them refusing to book new orders unless the old orders have been reduced through deliveries.

The condition of the market regarding domestic coals has resulted in premiums being asked for some of the so-called independent coals. Not all operators are asking premiums, but it is said that some are quoting prices ranging up to 50c. per ton above the regular company circular.

Chestnut coal is not as short as egg and stove, but dealers are glad to get it. Pea coal is in fair demand and is not long, the call for it being about normal.

There has been no reduction in the quantity of the buckwheat coals coming forward. While buckwheat is plentiful most buyers receive no concessions from the regular quotations, particularly when the better grades are wanted. Rice and barley are more noticeable. Quotations for good grades of rice coal range from $2.30 to $2.50 at the mines, and for barley from $1 to $1.25.

The quantity of the anthracite steam coals on hand has again brought to the front the question of a reduction of sizes. Some of the trade believe that with a reduction of sizes there would be a better opportunity to keep up with the demand for the domestic coals and that the buckwheats would not accumulate as easily as they now do.

Dumpings of anthracite at the local railroad piers for the week ended June 21 were 6046 cars as against 5611 cars the previous week, an increase of 435 cars. There were 2812 cars of anthracite at the docks as against 3112 cars on June 13, a decrease of 300 cars.

Current quotations, white ash, per gross ton at the mines, f.o.b. tidewater, at the lower ports, are as follows:

	Mine	Company Circular
Broken	$5.95	$7.80
Egg	6.05	7.90
Stove	6.30	8.15
Chestnut	6.40	8.25
Pea	5 00	6.75
Buckwheat	3.40	5.15
Rice	2.75	4.50
Barley	2.25	4.00

Bituminous—The situation at this market is dull. There is no buying and yet operators and shoppers see signs of brightness ahead. Some claim that the situation is brighter than last week. They claim to see business picking up slowly and believe that the next few weeks will see wonderful changes in conditions.

In this harbor there is little coal moving unless it is on contract. Buying is almost at a standstill, but there are some who are anxious at this late day to close contracts. There are practically no new contracts being considered unless they are for the poorer grades. The better grades have all been taken up and for that reason quotations for contract business have been practically removed from the market.

The labor situation is likely to play a prominent part in the coal industry for at least the balance of the winter. With peace near at hand there is a bare possibility that the mine workers may ask for an increase in pay, it being understood that their present agreement with the operators terminates upon the declaration of peace by the President, or it may continue in force until March 31, 1920. Some operators are looking at that phase of the situation in booking future business, while there are others, and they are by no means small in number, who do not anticipate any trouble. Labor is short-handed and operators hold out little hope that the situation will improve.

Shippers expect that buying of the free coals will soon pick up, due to the smallness of storage piles in most manufacturing places. They maintain that these customers, most of whom have failed to make contracts, are not willing to take any further risks for the market and will soon come forward with orders for coal.

The demand for the better grades is strong and orders have been booked for

weeks ahead; in fact, it is said that some operators have their output sold for the next six weeks and are refusing new orders. There is a good demand for gas coal.

The trade here is advising against excessive shipping to this harbor in the expectation of finding a ready market. Fears are entertained of an overstocked market which may result in price-cutting in order to move the coal. Producers are advised to ship only when they have a market, thereby avoiding the danger of being forced to dispose of their product at a loss.

There has been an improvement in the export situation which is encouraging. With the vesels coming into this harbor steadily increasing in number the bunker business is healthy. Some tradesmen say that were it not that many of the bottoms are equipped with oil burners it would be impossible with production as it now is to supply all the coal necessary.

During the week ended June 21 there were 5560 cars of bituminous coal dumped at the local railroad docks, as compared with 5748 cars the previous week, a decrease of 188 cars. On June 21 there were 4196 cars on hand at the docks as compared with 4394 cars on June 13, a decrease of 198 cars.

Quotations on some of the various pool coals f.o.b. this harbor are as follows:

Pool No. 9	$5.30@5.50	Pool No. 11	4.65@4.90
Pool No. 10	4.85@5.00	Pool No. 71	5.30@5.50

Following are quotations on various coals, per net ton at mine:

South Forks (Best)	$2.95@3.25
Cambria (Best)	2.75@2.95
Cambria (Ordinary)	2.35@2.50
Clearfield (Best)	2.75@2.95
Clearfield (Ordinary)	2.35@2.50
Reynoldsville	2.50@2.75
Quemahoning	2.75@2.95
Somerset (Best)	2.75@2.95
Somerset (Poor)	2.15@2.35
Western Maryland	2.25@2.50
Fairmont	1.75@2.00
Latrobe	2.10@2.25
Greensburg	2.25@2.35
Westmoreland ¾ in.	2.60@2.75
Westmoreland run-of-mine	2.35@2.50

PHILADELPHIA

Anthracite activity shows no sign of abatement. Full production absorbed. Dealers endeavoring to accumulate stocks. Moderate premiums asked. Retail demand strong on all sizes, especially egg and stove. Pea moving steadily. Buckwheat gains strength. Rice and barley very weak. Bituminous displays signs of strength. Consumers more interested. Some contracts closed. Bigger business predicted soon. Prices firm.

Anthracite—There is no sign of weakening in the market for prepared sizes. It is true that many of the smaller dealers will have delivered by July 1 practically all their orders, with the possible exception of stove coal. If the retailers who handle heavy tonnages have materially reduced their accumulation of orders it certainly does not show in their buying. A canvass of the numerous yards located here shows, with few exceptions, seriously small stocks. Every day more dealers are coming to the conclusion that there are troublesome times ahead for those in the trade who go into the fall season without full bins. In their advertisements they are freely predicting that the public will face a shortage, with higher prices, next winter.

All shippers consulted show no hesitancy in prophesying an indefinite demand for all family coals. We hear of premium prices being offered from other markets that are surprisingly high, especially on stove, but as usual this market is not paying any unusual prices. We heard of several instances where as much as 70c. premium on stove was asked, but no one is willing to admit that a sale was made at that price. In fact, we doubt if any of the shippers are charging their regular trade more than 30c. above company circular. Needless to say the big companies are adhering to their schedule of prices on all sizes from broken to No. 1 buckwheat inclusive.

Egg is in poor supply and the call for it is far greater than in any normal year. It would probably require no enormous tonnage to satisfy the immediate demand, but because so little of it is coming here most dealers are extremely short of it. The call for stove is so general and persistent that no producer will give any buyer any encouragement as to the ability of satisfying needs in the near future.

As last week, there is a heavier tonnage of chestnut in the yards than either egg or stove, but the retail demand continues quite strong on all sizes. Chestnut is apparently causing the shippers no concern, as they report the orders from the West show no signs of any weakness in that market. To the satisfaction of the shippers the pea-coal demand keeps up beyond their earlier expectations. Several of the larger buyers have recently placed orders for substantial blocks at circular. They now claim they had not been waiting with the hope of lower prices on this size, but that they have been too busy to spare their yard help to unload and store it. We believe that some of the poorer grades of pea coal are being moved by the shippers refusing to accept orders for the larger sizes unless they carry a proportion of pea with it.

Among the dealers the report is common that they are receiving little new business. This is particularly true in the industrial districts, where with the business on a strictly cash basis, many of the buyers are not yet in position to stock coal for the winter. One of the big retail companies in order to meet the argument of many customers that their houses might be sold before they used the coal, have used big space to advertise the fact that in case they have to move the incoming tenant would be more than glad to purchase the coal in the cellar. Of course there will be ordering right along and we are fully of the opinion that the people are even now becoming strongly cognizant of the fact that coal will be difficult to get next fall and winter.

In the steam coals buckwheat continues in its gradual gain in strength. Several independent houses who had been accepting business at considerably less, now report refusing all orders that do not carry the $3.40 price. Rice is slow to respond and continues troublesome. With the heavy tonnage now in storage we expect to see low prices on this size for some time. We hear of $2.50 being quoted, but believe sales are made at considerably less. Barley remains in the discard and one authority states that no reasonable offer would be refused.

Bituminous—We believe it can be said after a careful canvass of the trade that there is a stronger tone to soft coal. Consumers are becoming alive to the fact that they are going to need fuel and are also more keen in their desire to take in supplies. While many of the producing companies have all the contract tonnage they desire, there are some other concerns slow at first to go in for agreements, who are now accepting some tonnage from the best trade. It can also be said that big users of coal are really taking in more tonnage now than they are consuming, not wishing to be caught with short stocks next fall, when crop movement might interfere with the shipment of coal.

Yet with all the light buying so far this spring, one authority consulted is of the opinion that there is still more coal above ground now than there was at this time last year due to the extremely heavy stocks which were accumulated last year. The improvement in the iron trade has shown its reflection in the soft coal trade, and there is at this time a feeling of confidence that big business is not far away; some shippers really predict that within 60 or 90 days the demand is likely to be considerably greater than the supply. It was only during the past week that one operation producing high-grade coal actually reported a car shortage. While this was purely a local condition it is indicative of the fact that it will take only a very few weeks to change the entire aspect of the soft-coal trade.

The prices ruling in this market have been about as follows:

Georges Creek Big Vein	$2.90 @ $3.00
South Fork Miller Vein	2.90 @ 3.00
Clearfield (ordinary)	2.70 @ 2.80
Somerset (ordinary)	2.65 @ 2.75
Fairmont Lump	2.50 @ 2.60
Fairmont mine-run	2.35 @ 2.45
Fairmont slack	1.90 @ 2.00
Fairmont lump (ordinary)	2.25 @ 2.35
Fairmont mine-run (ordinary)	2.00 @ 2.10
Fairmont slack (ordinary)	1.70 @ 1.80

Due to the limited demand the matter of labor shortage has not made itself felt, but certainly will by the time orders begin to accumulate in the shipping offices, requiring full working time. No one believes for an instant that the production of last year can be approached, yet on the other hand the demand is likely to be almost as great when the industrial boom arrives, as all fully believe it will.

Lake Markets

PITTSBURGH

Car shortages threatening. Labor scarcity feared. Slack easier, mine-run steadier.

The Pittsburgh district coal market is somewhat stiffer in general tone, not so much by reason of heavier demand as by reason of prospects increasing that coal will be scarce next fall and winter on account of transportation and labor conditions. There has been little if any increase in buying. The steel industry, one of the largest consumers, is running a shade better, now averaging an operation of about 60 per cent. of capacity, against an average of 54 per cent. in May, the lightest month since about the beginning of 1915. It is questionable whether there will be much further improvement in mill operations in July and August, which are normally very dull months in the steel trade.

Car shortages have begun to appear. While they are of little moment in themselves they are held to bear an important augury. For instance, a developing mine that has an old rating of 4½ cars had been shipping 11 cars daily, getting the cars without going to the trouble to secure a new rating, and it was suddenly notified it would be cut down to its rating of 4½ cars. As a developing mine this mine could secure more cars by formal application.

Some uneasiness is felt by coal operators that there may be labor difficulties before the end of the coal year, through the miners taking advantage of the fact that the present wage arrangement expires by limitation when the peace proclamation is issued. Common labor is far from plentiful, while miners are indisposed to work full time.

The general average of market prices is about the same as for two or three weeks past, but in the past week there has been a slight further softening in steam slack and at the same time a little stiffening in mine-run, whereby we quote steam slack at $1.40 minimum instead of $1.50 and mine-run at $2 minimum instead of $1.90, the general run of prices being as follows: Best grades gas coal: Slack, $1.65 @ 1.85; mine-run, $2.35; screened, $2.60 @ 2.70; Steam: Slack, $1.40 at 1.70; mine-run, $2 @ 2.35; per net ton at mine, Pittsburgh district.

TORONTO

Shortage of stove coal the cause of delayed deliveries. Other sizes available. Dealers advise consumers to substitute egg and nut. Bituminous quiet.

There is no likelihood of dealers overtaking arrears in the delivery of anthracite for some weeks to come, as orders are being received by such dealers as will accept them in greater volume than the supplies coming forward. The principal cause of the delay in filling orders is due to the fact that about 85 per cent. of the domestic demand is for stove coal, while only about 30 per cent. of the shipments received from the mines are of this grade. The dealers are appealing to consumers to substitute egg and nut coal, which can be used to equal advantage in many cases, or mixed with stove coal. They state that the situation would be greatly relieved if this course were followed, as while there is a great shortage of stove coal, they can supply plenty of the other sizes. There is no improvement in the demand for bituminous of which there are ample supplies on hand with a downward tendency in prices.

Quotations for short tons are as follows:

Retail:	
Anthracite, egg, stove, nut and grate	$11.50
Pea	10.00
Bituminous steam	7.50
Slack	6.50
Domestic lump	10.00
Cannel	11.50
Wholesale f.o.b. cars at destination:	
Three-quarter lump	5.75
Slack	4.44

BUFFALO

Some stir in bituminous reported. Anthracite not plentiful enough to meet the demand.

Bituminous—The movement is much as it was. Shippers note an increased uncertainty on the part of consumers as to the chances of getting prompt service when the stir is here. Certain Canadian factory owners are asking jobbers what they may expect in July and August, if the demand stiffens. The reply is that early buying will obviate any difficulty, but that in any case the jobber ought to be advised in time of the change when it comes. Nobody doubts that it will come before long.

Not much coal is moving unsold. It is too risky. None has been reported here on consignment for a long time. In case any comes this way it finds its way to Canada in time to keep that market in a state of depression. The water movement from Ohio ports to the St. Lawrence is dull. A vessel in that trade lately has been unable to get a cargo. The report is that the territory is pretty well filled up. It will take a brisk stir in manufacturing to use up the output.

Slack coal is still weak, both it and mine-run being offered by certain mines at reduced prices. Jobbers for the most part are holding close to old prices and are quoting as follows: Thin-vein Allegheny Valley sizes, $4.65; Pittsburgh and No. 8 five-quarter lump, $4.45; same, three-quarter, $4.30; mine run, $4.05; all slack, $3.65 per net ton, f.o.b. Buffalo.

Anthracite—The supply continues to be less than the demand. All branches of the trade could use more coal. The mines are running sadly behind their previous output, and there is fear of a bad winter shortage if the output is not increased before long. At the same time, the local and rail demand is not so insistent as it was, and the shippers hope to be able to turn in a heavier tonnage to the lake trade soon. All lake ports that take coal by water are short of their usual quota. It is said that the St. Lawrence River and Lake Ontario ports are as deficient as are the upper-lake ports.

Anthracite prices in this market remain as follows:

	F.o.b. Cars, Gross Tons	At Curb Net Tons
Grate	$8.55	$10.20
Egg	8.65	10.40
Stove	8.90	10.60
Chestnut	9.00	10.70
Pea	7.20	9.15
Buckwheat	5.70	7.75

The loading to lake vessels is as brisk as receipts will permit. Shippers would like to turn everything in that direction for a while, till the shortage is made up, for tonnage is plentiful and that may not be the case all the season.

The amount loaded for the week is 117,250 net tons, of which 34,600 tons cleared for Chicago, 30,300 tons for Duluth and Superior, 25,950 tons for Milwaukee, 3000 tons for Marquette, 2600 tons for the Sault and 800 tons for Mackinaw.

Freight rates continue quiet at 60c. to Chicago, 50c. to the Sault and Mackinaw, 47½c. to Milwaukee, 42½c. to Duluth and Marquette.

CLEVELAND

Consumption of coal in northern Ohio continues to gain. Demand is reflecting this condition and prices are firmer. Domestic demand is being maintained surprisingly for this time of the year.

Bituminous—Industrial operations are rapidly approaching normal, with consumption of steam coal keeping full pace. Interest in the coal market is increasing each week. Talk of "good times" appears universal, and it is believed that the middle of next month will see coal consumption back close to the war level.

Slack demand is much better, and the price is much firmer. Around $2 continues the quotation on slack, compared with $1.35 a short time ago. Mine-run is hovering around the $2.10 mark, and it is not believed a great deal could be had for less. Talk of $2.50 slack in the winter is freely heard, and mine-run around $2.60 to $2.75 is another prediction.

Southern and eastern Ohio mines still are on a 55 to 60 per cent. operating basis. A shortage of cars is an every-other-day feature now. The chief restricting factor, however, is lack of labor. Operators fail to see how this can be remedied. Aliens are flowing out as fast as steerage accommodations to Europe can be had.

Anthracite and Pocahontas—The anticipation of a 30-cent increase the first of next month by dealers who have not tacked on the 20-cent advance already authorized, has prompted some buying of anthracite. Demand for Pocahontas is larger than that for anthracite and more difficult to meet. It is believed that Aug. 1 will see a large percentage of next winter's need of anthracite and Pocahontas filled.

Lake Trade—Loading of bituminous coal at Lake Erie ports last week amounted to 1,122,000 tons, and this week will total about 1,050,000 tons. Both cargo space and tonnage seem a trifle decreased this week. May loading probably will be around 4,000,000 tons, exclusive of vessel fuel. Some upper lake dock operators are complaining of the slow movement of bituminous from the docks. In May only 12,067 cars of bituminous left the upper lake docks, compared with 12,913 cars in May 1918, and 16,389 cars in May, 1917. For the five months ended with May 31 the number of cars moved from the docks has been 71,382, compared with 89,800 cars in the corresponding period of 1918, and 114,367 in 1917.

Prices of coal, per net ton, delivered in Cleveland are as follows:

Anthracite:	
Egg	$10.85 to 11.05
Chestnut	11.15 to 11.35
Grate	11.05
Stove	11.05 to 11.25
Pocahontas:	
Forked	9.00
Lump	8.25
Mine-run	7.20
Domestic bituminous:	
West Virginia splint	7.75 to 8.00
No. 8 Pittsburgh	6.10 to 6.35
Massillon lump	7.30 to 7.40
Steam coal:	
No. 6 slack	4.20 to 4.40
No. 8 slack	4.70 to 4.95
Youghiogheny	4.85 to 5.15
No. 8 ¾-in. lump	5.40 to 5.55
No. 6 mine-run	4.40 to 4.50
No. 8 mine-run	4.80 to 4.95

DETROIT

While demand for domestic coal is improving, steam coal is difficult to sell, with prices showing occasional concessions.

Bituminous—Consumers of steam coal in the local market have not yet overcome their apparent reluctance to commence stocking up. Orders coming from them are described as scattering and in small amount, according to jobbers and wholesalers. Reports coming to the jobbers indicate a somewhat unsatisfactory condition as regards car supply in certain West Virginia districts from which part of Detroit's supply is derived. Though the situation is causing no serious trouble yet, it is considered an indication that there is likely to be a less free movement of shipments as the season advances and other uses for cars become more pressing.

With the present movement of coal to Detroit almost unobstructed, the light buying demand for steam coal is curtailing shipments. Considerable coal is finding its way into the market, however, and a large part of the stock is fine coal. Jobbers say there is a moderate amount of coal unsold on tracks, and assert the amount is being magnified in the estimation of some buyers from the circumstance that they are solicited by several brokers offering the same consignment.

Lump of the West Virginia gas and splint type is offered at $2.75, with three-quarter lump at $2.50, mine-run $2.10 to $2.25, and slack $1.85, these quotations being for short ton, with freight and war tax to be added. Hocking domestic lump is quoted at $2.50, mine-run at $2, and slack at $1.50. It is admitted sales of slack have been made at a lower price, transactions having been reported at $1.25.

Smokeless is not reaching the market in very large quantity. There is a small amount of mine-run which is quoted at $2.75 to $3.

Anthracite—High temperatures have curtailed the buying of anthracite for household consumption. Dealers are continuing their campaign of publicity in the effort to encourage early distribution. Shipments are not of large amount, but retailers have a fair amount on hand.

Lake Trade—Shipments over the lake routes are being maintained to fair volume, though carriers are finding it necessary in some instances to shift from one loading dock to another to complete cargoes. Scarcity of downbound cargoes diverts an unusual amount of tonnage to the coal trade.

COLUMBUS

With a better demand for steam sizes and the lake trade going forward actively, the Ohio coal trade is in better shape. Screenings are still a drag on the market. Prices are stronger in most producing fields.

The best feature of the Ohio coal trade is the better demand for steam grades, with the exception of screenings. Mine-run is in better demand and purchasing agents for large plants are in the market for a considerable tonnage. Reserve stocks are being used up to a certain extent, and as a result more activity is displayed in contracting. Operators and distributors believe that the worst of the slump in steam business is now over and that there will be a steadily expanding trade. Iron and steel plants are using a larger amount of coal, and the same is true in certain lines of general manufacturing.

The lake trade is going along nicely with a fair tonnage being moved from Ohio and West Virginia mines to the Northwest. Most of the lake contracts have been made, so there is little opportunity to contract for lake tonnage. Dock interests are busy moving fuel to fill their docks. The movement off the docks to interior points has started.

The domestic trade is still rather slow as consumers are not buying to any great extent. But there is a better feeling in retail circles as householders are making inquiries regarding their fuel supply for the coming winter. The best demand is for the fancy grades, which are higher in price. The short time strike on the Norfolk & Western R.R. caused a flurry in Pocahontas, and some was sold at $6. The regular price for Pocahontas lump is around $5. West Virginia splints are selling well. Hocking and Pomeroy grades are also being bought more liberally, but there is little stocking of those varieties on the part of retailers. Retail stocks are not large.

Production is holding up well, despite the labor shortage which is appearing in some districts. The eastern Ohio field reports about 75 per cent. production and the same figures are reported from Pomeroy Bend. The Hocking Valley, Jackson and Cambridge fields are producing about 65 to 70 per cent. of normal.

CINCINNATI

Demand steady. Not much coal being stored. Prices being maintained.

The demand for all kinds of coal in this market continues steady. Orders are coming in nicely for both immediate and future delivery, with the volume of business being for immediate delivery, however. Dealers in all sections of the city find that there is not the demand for coal for storage this season that there was last year, since many of the coal users in this city have stocks left over. This seems to be especially true of the domestic users, who after stocking up last season for a severe winter encountered mild weather. Consequently their stock of coal was not much depleted. Many householders, however, are laying in quite a stock of smokeless coal, which was unobtainable here last year.

Manufacturers refuse to believe the dealers when they say there is danger of a shortage, and despite all the pressure that can be brought to bear they continue to buy only for their daily requirements. There is quite a good business being transacted by "snowbirds" in this city.

The prices on all grades of coal continue stiff. Some dealers make a specialty of going about 25c. below the market price on coal to stimulate buying at this time, but they are few and far between. The demand for steam coal continues steady, but few orders are being placed for lump coal at this time.

LOUISVILLE

Producers stocked with block orders for June and to about middle of July, many refusing to quote new business. Domestic situation tight, with steam market loose. Prices holding fairly well.

Many of the Kentucky producers are refusing to make quotations on block coal as they have business to run them to about the middle of July and cannot take care of additional business without orders for steam coal, which is still sluggish. It is believed that a better demand for screenings and mine-run will develop about the middle of July, resulting in better prices all around, and enabling the producers to get out a larger volume of block coal without being tied up with the resulting screenings.

The demand for block as a whole has been very good, and mine-run is moving somewhat better; but the nut and slack

situation is about the same as it has been, with industrial consumption not great enough to take care of the output.

Eastern Kentucky is operating around four full days per week, with some mines doing slightly better. It is held that they would all be operating full time if the steam market was right. There is still a considerable labor shortage in some districts, but the car supply is slightly better as a whole.

In western Kentucky things are still slow, with mines doing about two days a week, and scratching hard for business. Block coal is showing some improvement, but steam is very dull.

Such few mines as are quoting prices on eastern Kentucky block are asking $3.35@3.50 per ton for their coal, although such coal would be selling at around $3 if the screenings could be disposed of profitably.

Kentucky mine prices are as follows:

	Eastern Kentucky	Western Kentucky
Block and egg	$3.35@$3.50	$2.30@$2.55
Run-of-mine	2.25@ 2.40	1.90@ 2.00
Nut and slack	1.65@ 1.90	1.60@ 1.75

BIRMINGHAM

Steam market quiet, some contracts being signed by industrial consumers. Operators await developments in railroad purchases. Domestic market strong, the supply continuing short.

While some few contracts are being signed up by industrial interests for steam-coal requirements for the next twelve months, chief interest is now centered in the course to be pursued by the railroads in regard to renewing contracts for fuel for the ensuing year. The Southern Ry. has rejected all bids from this district, and is reported to have purchased some coal in the Tennessee field, although, on the other hand, operators in that field, it is stated, were unable to furnish the Southern the tonnage of coal normally taken from that district. Nothing definite can be learned as to just what action has been taken by this line. The Seaboard, so it is understood, has contracted for 140,000 tons of Big Seam coal from one of the larger commercial operators, and 40,000 tons of Carbon Hill coal from a combination of small operators in that field. Other lines in the district have taken no action as yet on renewal of contracts. Some coal is now going through the ports of Mobile and New Orleans to Cuban and South American interests, though this tonnage is necessarily limited by lack of bottoms, which condition is expected to be relieved by the allocation of more ships to these ports in the near future.

The domestic market is still strong, and lump coal is difficult to obtain, and this condition will not be relieved until such time as the steam market materially improves. Premium prices can be obtained for any free coal that is made available.

Coke

CONNELLSVILLE

Contracting for second half begins suddenly, terms being practically uniform.

Buyers and sellers suddenly found a basis on which they could get together for the making of contracts for furnace coke for second half delivery, and as a result fully one-half the business that was in prospect has been put through. It seems the way was blazed by the Oliver & Snyder Steel Co., itself a newcomer in the merchant field, and thus not tied down by previous practices while at the same time being able to offer one of the very best cokes in the region. This company's coke has gone exclusively to the Steel Corporation for many years, but the corporation quits with the expiration at the end of this month of the present three-year contract. The company has three plants, in the heart of the old basin, with a total rated capacity of 70,000 tons monthly, but on account of prospective operating and transportation conditions it limited its sales to 50,000 tons, and four contracts have been closed, covering this tonnage. In this and other business done the basis is a ratio of 6¼ to 1, relative to basic pig iron at valley furnaces.

Thus with pig iron at $25.75, nominally at least the present market, coke would be invoiced for the month at $4.12, with four cents rise or fall against each change of 25c. in pig iron. Contracts provide minima ranging from $3.50 down to $2.75, also maxima, but it is altogether unlikely pig iron will change enough between now and the end of the year to call either into play. Somewhat over 100,000 tons monthly has been closed, with about 100,000 tons more business to be done, allowing for some eastern furnaces to switch to eastern by-product coke as they probably will. The spot market is a shade easier, some sales having been made at $3.75 although the regular asking price is $4, with a few operators quoting more.

Foundry coke is in better demand, and while there remains some available for spot shipment at $4.50 the demand runs rather to the higher grades, held at $4.75 and $5. There has been rather free contracting for foundry coke for the second half of the year. Foundries would probably prefer to cover for the twelvemonth, but operators will not quote for the year, except at a stiff advance. The market is quotable as follows: Spot furnace, $3.75 @4; second half contracts, 6¼ to 1, against basic pig iron at valley furnaces; spot foundry $4.50@5; second half contracts $5@ $5.50 per net tons at oven.

The "Courier" reports production in the Connellsville and Lower Connellsville region in the week ended June 14 at 127,095 tons, an increase of 9446 tons.

Birmingham—The demand for foundry coke in this market is strengthening rapidly and a good aggregate tonnage is being sold. Present quotations on Brookwood are $8, and $9 per net ton ovens is being asked for Yolande foundry. Furnace coke is also experiencing a better demand with the blowing in of several furnaces which have been idle for some time, and is quoted at $6.50 ovens. There is no accumulation of either grade.

Buffalo—The market is a trifle stronger, but no particular activity is yet in sight. Iron ore moves more freely by lake and will probably from this time edge into a full season's activity. If it does not it will soon be impossible to bring down an average supply for the year, and no effort is ever made to supplement the lake cargoes by winter shipments by rail. This would be too expensive. Some new ore is chartering, but no new sales are reported. Coke prices continue at $7.25 to $7.60 for 72-hour Connellsville foundry, $7 for 48-hour furnace and $6.10 for off grades. Finely divided coke is not selling.

Cincinnati—Foundry coke is now in good demand, not alone for immediate requirements, but for shipment over the remainder of the year. Prices seem to be well established, on which basis buyers are showing little hesitancy in covering. It is expected that within the next two weeks virtually all coke contract buyers will have covered for their requirement.

Middle Western

GENERAL REVIEW

Inactivity in market conditions general. Domestic coals expected to increase in price in July. Mines unable to dispose of screenings.

The coal situation in the Middle West does not show the improvement confidently expected of it. The Middle West is perhaps one of the richest manufacturing territories in the United States, and it is discouraging to note that at this late date so many of our industries are in an inactive state. Those operators in our midst who are confirmed and habitual optimists still claim that the market on steam coals will boom as soon as peace is signed, and the various industries receive a chance to figure on what may be expected in the immediate future.

Prepared sizes on practically all grades are firm in price. Lump and egg from the mines producing low quality coal are moving to the railroads, and the same sizes from the high-grade coal fields of Illinois and Indiana are moving to the domestic trade. Prices are firm, and it is generally expected that they will be advanced on prepared sizes July 1.

In southern Illinois this advance will amount to 10c. per ton, bringing the cost of, say, Franklin County domestic coals to $2.95 per ton f.o.b. mines. The demand, however, for high-grade domestic coal is such that the operators could easily advance their prices to $3.15 and $3.25, and still be oversold, but they prefer not to take advantage of the present situation. They are to be commended on their attitude, which is in violent contrast to the New River and Pocahontas operators, who have advanced their prices until their lump and egg sizes are selling at from $4.50 to $5 mines. This contrast in policy is all the more noteworthy because Franklin County coal occupies the same position in the West that Pocahontas et al. occupies in the East. In other words, there are no successful substitutes for either Pocahontas or New River coals in West Virginia, or for Franklin County coal in Illinois.

The situation on screenings is bad, as mines having railroad contracts calling for lump coal are having a serious time in disposing of their fine coals. The steam buyers are not interested, and the only sales made in the past week have been closed on a basis that is below cost to the mines. The situation is serious, and the only hope of immediate salvation is that the signing of peace will bring about an industrial revival that will absorb the screenings now thrown on the market or being put in storage.

Apparently there is a lull in the contract situation, as according to our information practically no coal contract of any size, or importance, outside of railroad business, has been closed during the past week. Operators and jobbers have tried in vain to impress upon the trade the folly of buying coal on the open market, in the very face of conditions as they are at present. Producers and distributors feel that they have done their best, and are now awaiting, with resignation, further developments, which will lead to a coal shortage.

CHICAGO

General dullness in steam trade with demand brisk for prepared sizes.

The local situation differs in no radical extent to conditions experienced by the trade throughout the Middle West. The demand for steam coals is dull in the extreme, and the situation on prepared coals is keen.

The movement of eastern coal into this market continues heavily. It is reported that a number of distributors for the anthracite mines are from three to eight weeks behind on their orders. Some are not taking further business at this time, and others are taking orders only subject to delays.

MILWAUKEE

Coal market experiencing the usual summer quiet. Movement moderate only. Receipts by lake continue ahead of last year.

With the thermometer registering between 80 and 90 deg. daily, the coal market may be said to be in the doldrums. The demand is only moderate, despite a campaign of publicity to induce consumers to stock up early and guard against a shortage of fuel the coming winter. Coke is also moving slowly and the byproduct plants are accumulating large piles in their storage yards. Small sizes of gas coke are being advertised at $9.50, carried in. The Milwaukee Association of Commerce is pursuing an investigation of coal costs from the mines to the Milwaukee consumer in order to determine whether present prices are justified. Coal cargo receipts by lake continue in excess of last year's record. Thus far 205,967 tons of anthracite and 1,026,471 tons of soft coal have been received, a gain over 1918 of 74,456 tons of the former and 376,877 tons of the latter.

ST. LOUIS

Conditions are quiet, with a plentiful supply of all grades of coal and an oversupply of steam, which threatens to become a serious handicap toward getting out a sufficient tonnage of larger sizes. Very little storage coal coming in. Country demand light.

The steam business is demoralized. Throughout the entire Mississippi territory there is an industrial depression that has brought the coal trade face to face with a serious problem, that of taking care of the steam sizes. Many mines are dumping their screenings and smaller sizes on the ground, and some have no more available space in which to do this. Many mines have orders for domestic sizes for three or four weeks ahead and are able to work only one and two days a week on account

Hampton Roads Coal Exports

Lamberts Point					
June	2	Amer. S.S. Achilles	Cristobal, C. Z.	12,113	1,073
June	2	Amer. S.S. Lake Pachuta	San Juan, P. R.	2,820	407
June	3	Amer. S.S. M. J. Scanlon	Rio de Janeiro, Brazil	6,030	0
June	5	Amer. S.S. Masca	Leghorn, Italy	4,385	0
June	5	Am. Sch. Ernest Mills	Buenos Aires, A. R.	916	....
June	6	Nor. S.S. Stavangeren	Curacao, D. W. I.	1,097	262
June	6	Nor. S.S. Pacific	Montevideo, Uruguay	8,200	0
Sewalls Point					
June	2	Amer. S.S. Lithipolis	Havanna, Cuba	2,820	407
June	3	Amer. S.S. Isonomia	Rio de Janeiro, Brazil	4,875	604
June	4	Am. Sch. Albert T. Paul	Rio Grande do Sul, Brazil	1,092	....
June	4	Amer. S.S. Calispell	Havana, Cuba	3,028	142
June	4	It. Bk. Spica	Genoa, Italy	1,944	....
June	5	Amer. S.S. Lake Cayuga	Havana, Cuba	2,358	322
June	5	Ital. S.S. Ansaldo, II	Genoa, Italy	6,454	996
June	6	Amer. S.S. Transportation	Rio de Janeiro, Brazil	5,124	1,558
June	7	Nor. S.S. Harriet	Santiago, Cuba	1,900	200
Newport News					
May	31	Dut. S.S. Slot rdijk	Rotterdam, Holland	4,109	692
June	2	Amer. S.S. Lake Stirling	Havana, Cuba	2,413	337
June	2	Amer. S.S. Lake Land	Havana, Cuba	3,501	357
June	2	Amer. S.S. Yadkin	Santiago, Cuba	2,125	247
June	3	Amer. S.S. Lake Gormannia	Port of Spain, Trinidad	2,915	541
June	3	Dut. S.S. Kralingen	Rotterdam, Holland	1,861	180
June	6	Am. Sc. Rosalie Hull	Rio Grande do Sul, Brazil	243	....
.....		Am. Sc. Rosalie Hull	Porto Alegro, Brazil	1,000	....

of having no sale for the steam sizes. This is affecting the Carterville field more seriously than anywhere else. There has been a noticeable increase in the demand for domestic coal in this field, but most mines are unable to take care of the business. The labor shortage still continues to bother the operators. The car supply is plentiful and the movement is good. Similar conditions prevail in the Du Quoin field. In both of these districts there is a fairly good movement of railroad fuel.

In the Mt. Olive district railroad fuel still helps to keep this field in a somewhat healthy condition. The domestic and steam sizes are going to Chicago and the Northwest, and in a general way the business in this district is satisfactory, everything considered.

The Standard field presents an unusual condition. There is no screening market and no demand for lump, and it is a question as to how long some operators can hold out with the present prices and the light demand. The cost of selling coal from this district has increased several hundred per cent. in the last few months. The preparation is not all that it should be, and there is much dissatisfaction among the miners. The operators, too, appear disgruntled and dissatisfied because the industrial conditions have not shown some improvement.

The present prevailing prices per ton f.o.b. mines are:

	Williamson and Franklin County	Mt. Olive and Staunton	Standard
Association:			
Lump, egg and nut	$2.85	.....	.....
Washed Nos. 1 and 2 nut	2.85	.....	.....
Independent:			Lump $2.00 & up
Lump, egg and nut	2.75	$2.55 Egg	1.75
Washed Nos. 1 and 2 nut	2.85	.....	.....
Mine-run	2.45	2.20	1.60@1.70
Screenings	2.20	2.05	1.35@1.50
3-in. lump	....	2.30	.....
2-in. lump	....	.....	1.75
2x6 egg	....	.....	1.75 & up

Williamson-Franklin County rate to St. Louis is $1.07½; other rates, $0.92½.

I. C. C. Decisions

No. 10237—Seaboard Byproduct Coke Co. vs. Erie Railroad Co., Director General, et al. Submitted Feb. 4, 1919. Decided Apr. 16, 1919.

Rate on byproduct coke, in carloads, from Seaboard, N. J., to Troy, N. Y., found to have been unreasonable. Reparation awarded.

No. 10315 Clark-Davis Coal Company et al vs. Director General, Delaware, Lackawanna & Western Railroad Co. et al. Submitted May, 19 1919. Decided May 21,1919.

Rates charged for the transportation of anthracite coal, in carloads, from Scranton, Penn., to South Utica, N. Y., for delivery by the West Shore R. R., found to have been unreasonable and unduly prejudicial to the extent that they exceeded the rates contemporaneously in effect from Scranton to Utica, N. Y. Reparation awarded.

No. 9734. Middlesboro Kentucky Coal Operators' Association vs. Louisville & Nashville Railroad Company et al. Submitted Mar. 31, 1919. Decided May 19, 1919.

Upon complaint alleging that the Middlesboro mines are subjected to undue prejudice and disadvantage by reason of refusal of the Louisville & Nashville R.R. to establish and maintain rates therefrom to points in the southeast via its line through Corbin, Held: There appears to be no necessity for establishing a route through Corbin. The record does not disclose the basis upon which cars are at present distributed, and the Director General has not been made a defendant. Complaint dismissed.

General Statistics

PRICES OF COAL AT PANAMA CANAL

Coal is being supplied to steamships, including warships of all nations, in transit through the Panama Canal, delivered and trimmed in bunkers, at $11.50 per ton of 2240 lb. at either Cristobal or Balboa. For ships not in transit through the canal, $11.50 at Cristobal and $13.50 per ton at Balboa. For ships taking less than carload lots from plants or less than 25 tons from lighters, the price is $13 per ton at Cristobal, $15 at Balboa.

ANTHRACITE SHIPMENTS FOR MAY, 1919

The shipments of anthracite for May, as reported to the Anthracite Bureau of Information, amounted to 5,711,915 gross tons, as compared with 5,224,715 tons in April and with 6,887,256 tons in May, 1918. The increase of nearly 500,000 tons over April is gratifying, for it was accomplished in spite of the fact that most of the mines were shut down on Ascension Day and Memorial Day. The decrease as compared with May, 1918, was chiefly in steam sizes as, because of the war demands a year ago, washery tonnage was an important factor, whereas comparatively little washery coal was shipped last month.

The shipments by companies were as follows:

	May, 1919	May, 1918	Coal Year, 1919–1920	Coal Year 1918–1919
P. & R. Ry	1,156,119	1,356,878	2,200,311	2,590,390
L. V. R.R.	1,030,160	1,328,464	1,896,084	2,503,491
C. R.R. of N. J.	498,521	566,974	980,302	1,095,860
D., L. & W. R.R.	914,301	1,037,603	1,799,516	2,045,621
D. & H. Co.	667,227	825,990	1,270,706	1,597,543
Penna. R.R.	401,918	493,380	785,168	941,754
Erie R.R.	621,326	761,436	1,202,779	1,456,622
N. Y., O. & W. Ry.	167,403	177,072	312,259	362,722
L. & N. E. R.R.	254,940	339,459	489,505	661,626
Total	5,711,915	6,887,256	10,936,630	13,255,629

MOVEMENT OF ILLINOIS, INDIANA AND LAKE DOCK COAL

The movement of bituminous coal from Illinois, Indiana and the Upper Lake docks into the northwestern states in 1917, with preliminary estimates for 1918, indicate the effect of the zone system on the movement of coal in 1918. This statement is given below because of the present demand for these statistics, in advance of the publication of the final reports of the Geological Survey for 1917 and 1918, now in process of completion. The tabulation is compiled by C. E. Lesher, of the Geological Survey.

From	1917 Illinois	1917 Indiana	1917 Lake Docks	1918 Illinois	1918 Indiana	1918 Lake Docks
Iowa	4,026,000	247,000	271,560	3,597,000	90,000	225,000
Wisconsin	1,936,000	564,000	4,484,768	2,486,000	617,000	4,870,000
Minnesota	1,801,000	199,000	4,151,132	1,968,000	28,000	4,565,000
North Dakota	43,000	3,000	618,131	8,000	200	654,000
South Dakota	231,000	15,000	477,961	228,000	500	610,000

Coal and Coke Securities

New York Stock Exchange Closing Quotations June 23, 1919

STOCKS	Ticker Abvn.	Bid	Asked
American Coal Co. of Allegheny	(ACL)	45	...
Burns Brothers, Com.	(BB)	145	150
Burns Brothers, Pfd.	(BB)	99½	115
Central Coal & Coke, Com.	(CK)	55	...
Central Coal & Coke, Pfd.	(CK)	63	...
Colorado Fuel & Iron, Com.	(CF)	47½	48
Colorado Fuel & Iron, Pfd.	(CF)	103	125
Consolidation Coal of Maryland	(CGM)	75	...
Elk Horn Coal, Com.	(EH)	37	37½
Elk Horn Coal, Pfd.	(EH)	...	47
Island Creek Coal, Com.	(ICR)	39	...
Island Creek Coal, Pfd.	(ICR)	75	...
Jefferson & Clearfield Coal & Iron, Pfd.	(JF)	60	...
New Central Coal of West Va.	(NCC)	5	...
Pittsburgh Coal, Com.	(PC)	62½	63½
Pittsburgh Coal, Pfd.	(PC)	93	95
Pond Creek Coal	(PD)	18½	19
Virginia Iron, Coal & Coke	(VK)	67	68

BONDS	Bid	Asked
Cahaba Coal, 1st Gtd. 6s, 1922	90	...
Clearfield Bituminous Coal, 1st 4s, Ser. A, 1940	71	...
Colorado Fuel & Iron, Gen. 5s, 1943	91	92
Colorado Indus. 1st Mtg. & Col. Tr. 5s, 1934	79	80
Consolidation Coal of Maryland, 1st Ref. 5s, 1950	87	92½
Jefferson & Clearfield Coal & Iron, Sec. Mort. 5s, 1926	96	...
Lehigh Valley Coal, 1st Gtd. 5s, 1933	99½	101
Lehigh Valley Coal, Gtd. Int. Red. to 4%, 1913	79½	...
Lehigh Val. Coal & Nav. Con. S. F., 4½s, Ser. A, 1954	90	...
Pleasant Valley Coal, 1st S. F., 5s, 1928	80½	...
Pocahontas Coal & Coke, Joint 4s, 1941	84	84½
Pocahontas Con. Collieries, 1st S. F. 5s, 1957	86	87½
Roch. & Pitts. Coal & Ir., Helvetia Pur. Money 5s, 1946	98	...
St. L., Rocky Mnt. & Pac. Stamped 5s, 1955	...	81
Tenn. Coal, Iron & R.R., Gen. 5s, 1951	93	94
Utah Fuel, 1st Sinking Fund 5s, 193'	87	...
Victor Fuel, 1st Mtg. Sinking Fund 5s, 1953	55	70
Virginia Iron, Coal & Coke 1st 5s, 1949	86	88½

CURRENT PRICES—MATERIALS & SUPPLIES

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Company as per Department of Commerce Committee Schedule.

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$30.75	$30.35
Northern Basic	27.55	27.55
Southern Ohio No. 2	28.55	28.55
NEW YORK, Tidewater delivery		
Penna. 2X	31.90	.....
Virginia No. 2	31.15	32.40
Southern No. 2	33.95	34.70
BIRMINGHAM		
No. 2 Foundry	26.75	25.75
PHILADELPHIA		
Eastern Pa. No. 2	30.65	31.90
Virginia No. 2	30.85	33.25
Basic	30.90	29.65
Grey Forge	30.90	29.65
Bessemer	31.85	.....
CHICAGO		
No. 2 Foundry Local	27.25	26.75
No. 2 Foundry Southern	31.75	53.00
PITTSBURGH, including freight charge from the Valley		
No. 2 Foundry	28.15	26.25
Basic	27.15	25.75
Bessemer	29.35	29.35

* F.o.b. furnace. † Delivered.

STRUCTURAL MATERIAL—The following are the base prices, f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York Current	New York One Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2.45	$3.47	$4.19½	$3.39	$3.47
Channels, 3 to 15 in.	2.45	3.47	4.19½	3.39	3.47
Angles, 3 to 6 in., ¼ in. thick	2.45	3.47	4.19½	3.39	3.47
Tees, 3 in. and larger	2.45	3.52	4.19½	3.39	3.47
Plates	2.66	3.67	4.44½	3.39	3.67

BAR IRON—Prices in cents per pound at cities named are as follows:

Pittsburgh	Cincinnati	St. Louis	Denver	Birmingham
2.75	3.25	3.44	4.30	3.50

NAILS—Prices per keg from warehouse in cities named:

	Mill Pittsburgh	St. Louis	Denver	Chicago	Birmingham	San Francisco	Dallas
Wire	$3.25	$3.90	$4.90	$3.90	$4.50	$3.90	$4.75
Cut	4.25	6.50	4.61	5.50	....	6.00	....

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh	Chicago	St. Louis	San Francisco	Birmingham	Denver
Standard railroad spikes ⅜-in. and larger	$3.35	$4.27	$4.44	$5.65	$5.25	$5.05
Track bolts	4.35	5.17	Prem.	6.65	8.00	6.05
Standard section angle bars	3.00	4.22	Prem.	4.60	....	4.45

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring fair-sized lots, the following discounts hold:

Cincinnati	Cleveland	Chicago	St. Louis	Denver	Birmingham
17½%	List —5%	List —2%	+15%	+20%	+20%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$5.75	$7.50	$6.50	$7.25	$8.50	$7.35
Assorted	6.40	7.50	6.50–7.00	6.40	8.75	7.60

Cincinnati—Horseshoe nails sell for $4.50 to $5 per 25-lb. box.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Current	New York One Month Ago	New York One Year Ago	Chicago	St. Louis	San Francisco	Dalla
4 in.	$55.70	$60.70	$64.35	$54.80	$48.00	$72.50	$59.00
6 in. and over	52.70	57.70	61.35	51.80	45.00	69.55	56.00

Gas pipe and 16-ft. lengths are $1 per ton extra.

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard Bessemer rails	$45.00	$55.00	$45.00	$65.00
Standard openhearth rails	47.00	57.00	47.00	67.00
Light rails, 8 to 10 lb.	2.58½*	3.13½*	2.83½*	3.13½*
Light rails, 12 to 14 lb.	2.54*	3.09*	2.79*	3.09*
Light rails, 25 to 45 lb.	2.45*	3.00*	2.70*	3.00*

* Per 100 lb.

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges:

	New York	Chicago	St. Louis
No. 1 railroad wrought	$18.50	$16.50	$15.50
Stove plate	16.00	16.50	15.50
No. 1 machinery cast	22.00	22.00	19.50
Machine shop turnings	8.00	6.75	7.00
Cast borings	9.50	9.75	7.50
Railroad malleable cast	13.50	16.50	14.00

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver
$0.12	$0.16½	$0.18	$0.13	$0.18½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham
Solid	16c.	13c.	15c.
Hollow	24c.	.....	..

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Jan. 1, 1919 for steel pipe and for iron pipe:

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	50½%	24%	⅛ to 1¼	39½%	23½%
½	54½%	40%			
¾ to 3	57½%	44%			

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 4	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	46½%	29%	½ to 1¼	39½%	24½%
½	51½%	39%			
¾ to 1¼	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4	35½%	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Stocks discounts in cities named are as follows:

	New York Black	New York Galvanized	Cleveland Black	Cleveland Galvanized	Chicago Black	Chicago Galvanized
⅛ to 3 in. steel butt welded	47%	31%	46½%	31%	57½%	44%
3½ to 3 in. steel lap welded	42%	27%	42½%	27½%	53½%	41%

Malleable fittings. Class B and C, from New York stock sell at list + 12½%
Cast iron, standard sizes, 10% off.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+12½%
Galvanized cast steel rigging	7½%
Bright plain rigging	35%
Bright cast steel	22½%
Bright iron and iron tiller	5%

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	Pittsburgh, Mill in Carloads	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Chicago Current
*No. 28 black	4.35	5.62	6.22	6.45	5.27	5.37
*No. 26 black	4.25	5.52	6.12	6.35	5.17	5.27
*Nos. 22 and 24 black	4.20	5.47	6.07	6.30	5.12	5.22
Nos. 18 and 20 black	4.15	5.42	6.02	6.25	5.07	5.17
No. 16 blue annealed	3.75	4.77	5.37	5.65	4.67	4.77
No. 14 blue annealed	3.65	4.67	5.27	5.55	4.57	4.67
No. 10 blue annealed	3.55	4.57	5.17	5.45	4.47	4.57
*No. 18 galvanized	5.70	7.42	7.57	7.70	6.62	6.72
*No. 26 galvanized	5.40	7.12	7.27	7.40	6.32	6.42
No. 24 galvanized	5.25	6.97	7.12	7.25	6.17	6.27

* For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair sizes orders, the following amount is deducted from list:

	New York Current	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago	St. Louis Current
Hot pressed square	$1.28	$1.90	$1.40	$2.00	$1.05	$2.25
Hot pressed hexagon	1.08	1.90	1.20	2.00	.85	2.25
Cold punched square	3.25	1.90	.75	1.30	1.00	2.25
Cold punched hexagon	2.70	1.90	.75	1.30	1.00	2.25

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50—10%	40%
Chicago	50%	50%
Cleveland	60–10–10%	60%
St. Louis	45%	....

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago	St. Louis
⅜ by 4 in. and smaller	50–10%	50%	50–10%	50–10%
Larger and longer up to 1 in. by 30 in.	40–10%	40%	40–10%	40–10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York.....$1.25 Cleveland.....$3.50 Chicago.....$2.25

For cast-iron washers the base price per 100 lb. is as follows:
New York.....$6.00 Cleveland.....$3.75 Chicago.....$4.00

RIVETS—The following quotations are allowed for fair sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅜ and smaller	65%	60—5%	45%
Tinned	65%	60—5%	40%

Boiler, ¾, ⅞, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:
New York..$4.72 base Cleveland..$4.00 Chicago..$4.87 Pittsburgh...$4.65

Structural, same sizes:
New York..$4.82 Cleveland..$4.10 Chicago..$4.97 Pittsburgh...$4.75

CONSTRUCTION MATERIALS

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Raw in barrel	$1.93	$1.55	$2.00	$1.65	$2.10	$1.65
5-gal. cans	2.06	1.65	2.25	1.80	2.30	1.75

WHITE AND RED LEAD—Base price.

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Year Ago Dry and In Oil
100-lb. keg	13.00	14.50	12.25	12.50	13.00	12.25
25 and 50-lb. kegs	13.25	14.75	12.50	12.75	13.25	12.50
12½-lb. keg	13.50	15.00	12.75	13.00	13.50	12.75
5-lb. cans	15.00	16.50	14.25	14.00	15.00	14.50
1-lb. cans	16.00	17.50	14.25	14.50	16.00	14.50

500 lb. lots less 10% discount. 2000 lb. lots less 10–2½% discount.

COMMON BRICK—The prices per 1000 in cargo or carload lots are as follows:

Chicago	12.00	Birmingham	$15.00
St. Louis, salmon	10.00	Denver (hard red)	12.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco.

	1-Ply C.l.	1-Ply L.c.l.	2-Ply C.l.	2-Ply L.c.l.	3-Ply C.l.	3-Ply L.c.l.
No. 1 grade	$1.35	$1.60	$1.70	$1.95	$2.05	$2.30
No. 2 grade	1.20	1.45	1.50	1.75	1.80	2.05

Asbestos asphalt saturated felt (14 lb. per square) costs $5.00 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.80 per roll in carload lots and $2.05 for smaller quantities.

Shingles, red and green slate finish cost $5.00 per square in carloads, $5.25 in smaller quantities, in Philadelphia.

ROOFING MATERIAL—Prices per ton f. o. b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$50.00	$50.00	$51.00	$51.50
Tar pitch (in 400-lb. bbl.)	19.00	16.00	20.00	17.00
Asphalt pitch (in barrels)	30.00	30.00	35.50	35.50
Asphalt felt	65.00	65.00	69.50	69.50

HOLLOW TILE—Price per block in carload lots for hollow building tile:

	4x12x12	8x12x12	12x12x12
St. Paul	$0.056	$0.11	$0.162
St. Louis	.08	.15	.....
Seattle	.09	.175	.30
Los Angeles*	.082	.154	.236
New Orleans	.165	.22	.325
Pittsburgh	.065	.115	.....
Chicago	.08	.144	.....
Denver	.125	.18	.....

*F. o. b. factory, 4, 8 and 10 inch.

LUMBER—Price of pine per M in carload lots:

	1-In. Rough 10 In. x 16 Ft.	2-In. T. and G. 10 In. x 16 Ft.	8 x 8 In. x 20 Ft.
St. Louis	$30@51	$35.00	$33.00
Birmingham	39.00	33.00	31.00
Denver	43.25	35.90	43.00
Cincinnati	43.00	42.00	37.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25-lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.27½	$0.30	.....	$2.40
Boston	$0.22½	.24½	.26½	$0.31	2.40
Kansas City	.19	.23½	.26½	.30	2.45
New Orleans	.22½ (50%)	.23½	.24½	.....	.....
Seattle	.14½	.18½	.21	.....	.....
Chicago	.18½	.21½	.25½	.....	.....
St. Paul	.19	.22½	.26½	.....	2.45
St. Louis	.19	.21½	.23½	.30	2 25
Denver	.17½	.22	.24½	.28½	2 60
Dallas	.189	.22⁵	.288	.342	.....
Los Angeles	.196	.237	251	.....	2 75

MISCELLANEOUS

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	Cincinnati	St. Louis	Birmingham	Denver
Cup	7	7	8½	14½
Fiber or sponge	8	13	8½	18
Transmission	7	13	8½	17
Axle	4½	4½	4½	5½
Gear	4½	7½	8½	8
Car journal	22 (gal.)	4.9	8½	8

BABBITT METAL—Warehouse prices in cents per pound:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Best grade	87.00	90.00	79.00	100.00	75.00	100.00
Commercial	42.00	50.00	18.50	22.00	15.00	22.00

HOSE—Following are prices of various classes of hose:

Fire

	50-Ft. Lengths
Underwriters' 2½-in.	75c. per ft.
Common, 2½-in.	30%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.55	$0.40	$0.30

Steam—Discounts from list

First grade	25%	Second grade	35%	Third grade	40%

LEATHER BELTING—Present discounts from list in cities named:

	Medium Grade	Heavy Grade
St. Louis	45%	50%
Denver	35–5%	30%
Birmingham	30%	35%
Chicago	45%	35%
Cincinnati	30–5–2½%	40–2½%

RAWHIDE LACING—20% for cut: 45c. per sq.ft. for ordinary.

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.90
Asbestos for high-pressure steam	1.60
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.60
Compressed asbestos sheet	1.00
Wire insertion asbestos sheet	1.20
Rubber sheet	.60
Rubber sheet, wire insertion	.80
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided, and graphited, for valve stems and stuffing boxes	1.20
Asbestos wick, ¼- and 1-lb. balls	.85

MANILA ROPE—For rope smaller than ⅜-in. the price is ½ to 2c. extra: while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅜-in., 8 ft., ½-in., 6; ⅝-in., 4½; 1 in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ⅜-in. and larger, in 1200-ft. coils:

Boston	$0.25	Atlanta	$0.30
New York	.27	Denver	.29
St. Louis	.26½	Kansas City	.28½
Chicago	.26½	New Orleans	.27½
St. Paul	.28	Seattle	.27
San Francisco	26	Los Angeles	.26

PIPE AND BOILER COVERING—Below are discounts and part of standard lists:

PIPE COVERING Pipe Size	Standard List Per Lin.Ft.	BLOCKS AND SHEETS Thickness	Price per Sq.Ft.
1-in.	$0.27	½-in.	$0.27
2-in.	.36	1-in.	.30
6-in.	.80	1½-in.	.45
4-in.	.60	2-in.	.60
3-in.	.45	2½-in.	.75
8-in.	1.10	3-in.	.90
10-in.	1.30	3½-in.	1.05

85% magnesia high pressure ..... List

For low-pressure heating and return lines ..... 4-ply.... 58% off; 3-ply.... 60% off; 2-ply.... 62% off

WIRING SUPPLIES—New York prices for tape and solder are as follows:

Friction tape, ⅙ lb. rolls	48c. per lb.
Rubber tape, ¼-lb. rolls	60c. per lb.
Wire solder, 50-lb. spools	46c. per lb.
Soldering paste, 2-oz. cans	$1.20 per doz.

COPPER WIRE—Prices per 1000 ft. for rubber-covered wire in following cities:

	Denver Single Braid	Denver Double Braid	Denver Duplex	St. Louis Single Braid	St. Louis Double Braid	St. Louis Duplex	Birmingham Single Braid	Birmingham Double Braid	Birmingham Duplex
No. 14	$15.00	$16.00	$34.00	$11.00	$20.00	$31.50	$12.67	$15.25	$27.75
10	17.65	24.25	48.00	25.40	29.00	59.00	20.25	24.25	46.90
8	24.50	31.75	70.00	35.45	35.00	72.50	27.60	32.60	.....
6	39.00	42.25	.....	.....	61.00	120.00	48.25	54.75	.....
4	56.00	58.95	.....	.....	86.00	.....	66.40	73.75	.....
2	85.00	86.15	.....	.....	130.00	.....	96.00	104.50	.....
1	110.00	113.10	.....	.....	176.00	.....	127.00	136.50	.....
0	165.00	158.00	.....	.....	222.00	.....	169.00	179.00	.....
00	.....	183.60	.....	.....	270.00	.....	203.50	214.00	.....
000	.....	222.80	.....	.....	330.00	.....	246.50	257.50	.....
0000	.....	269.70	.....	.....	400.00	.....	295.50	308.00	.....

FREIGHT RATES—On finished steel products in the Pittsburgh district including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains etc., the following freight rates per 1000 lb. are effective:

Boston	$0.30	New Orleans	$0.38½
Buffalo	.17	New York	.27
Chicago	.27	Philadelphia	.24½
Cincinnati	.23	St. Louis	.24
Cleveland	.17	St. Paul	.49*
Denver	.99	Pacific Coast (all rail)	1.25*
Kansas City	.59		

Note—Add 3% transportation tax. Minimum carload, 80,000 lb.